ATARI
G A M E S

ASSAULT

Operators Manual

with Illustrated Parts Lists and Schematics

ATARI GAMES
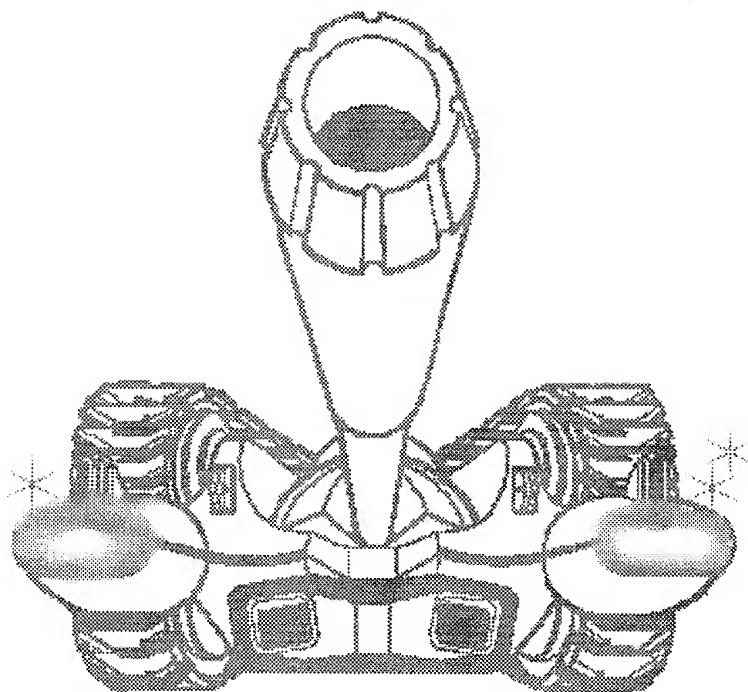
Assault™ Operators Manual

with Illustrated Parts Lists, Schematics, and Wiring Diagrams

Notice Regarding Non-Atari® Parts

```
WARNING
Use of non-Atari parts or modifications of
any Atari game circuitry may adversely affect
the safety of your game, and may cause in-
jury to you and your players.
```

You may void the game warranty (printed on the inside back cover of this manual) if you do any of the following:

* Substitute non-Atari parts in the game.

* Modify or alter any circuits in the game by using kits or parts *not* supplied by Atari Games Corporation.

NOTE

This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of Federal Communications Commission (FCC) Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area or modification to this equipment is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference. If you suspect interference from an Atari game at your location, check the following:

* All ground wires in the game are properly connected as shown in the game wiring diagram.

* The power cord is properly plugged into a grounded three wire outlet.

* On games provided with an Electromagnetic Interference (EMI) ground cage, be sure the game printed-circuit boards (PCBs) are properly installed in the EMI Ground Cage and the end board is securely installed with **all** screws in place and tightened. If you are still unable to solve the interference problem, please contact Customer Service at Atari Games Corporation. See the inside front cover of this manual for service in your area.

Table of Contents

List of Illustrations

List of Tables

Safety Summary

The following safety precautions apply to all game operators and service personnel. Specific warnings and cautions will be found in this manual whenever they apply.

WARNING

Properly Ground the Game. Players may receive an electrical shock if this game is not properly grounded! To avoid electrical shock, do not plug in the game until it has been inspected and properly grounded. This game should be only be plugged into a grounded three-wire outlet. If you have only a two-wire outlet, we recommend you hire a licensed electrician to install a three-wire grounded outlet. If the control panel is not properly grounded, players may receive an electrical shock! After servicing any part on the control panel, check that the grounding wire is firmly secured to the inside of the control panel. After you have checked this, lock up the game.

AC Power Connection. Before you plug in the game, be sure that the game's power supply can accept the AC line voltage in your location. The line voltage requirements are listed in the first chapter of this manual.

Disconnect Power During Repairs. To avoid electrical shock, disconnect the game from the AC power before removing or repairing any part of the game. If you remove or repair the video display, be very careful to avoid electrical shock. High voltages continue to exist even after power is disconnected in the display circuitry and the cathode-ray tube (CRT). Do not touch the internal parts of the display with your hands or with metal objects! Always discharge the high voltage from the CRT before servicing it. Do this after you disconnect it from the power source. First, attach one end of a large, well-insulated, 18-gauge jumper wire to ground. Then momentarily touch the free end of the grounded jumper wire to the CRT anode by sliding the wire under the anode cap. Wait two minutes and do this again.

Use Only Atari Parts. To maintain the safety of your Atari game, use only Atari parts when you repair it. Using non-Atari parts or modifying the game circuitry may be dangerous, and could injure you and your players.

Handle the CRT With Care. If you drop the CRT and it breaks, it may implode! Shattered glass from the implosion can fly six feet or more.

Use the Proper Fuses. To avoid electrical shock, use replacement fuses which are specified in the parts list for this game. Replacement fuses must match those replaced in fuse type, voltage rating, and current rating. In addition, the fuse cover must be in place during game operation.

CAUTION

Properly Attach All Connectors. Make sure that the connectors on each printed circuit board (PCB) are properly plugged in. The connectors are keyed to fit only one way. If they do not slip on easily, do not force them. If you reverse a connector, it may damage your game and void your warranty.

Ensure the Proper AC Line Frequency. Video games manufactured for operation on 60 Hz line power (used in the United States) must not be operated in countries with 50 Hz line power (used in Europe). If a 60 Hz machine operates on 50 Hz line power, the fluorescent line ballast transformer will overheat and cause a potential fire hazard. Check the product identification label on your machine for the line frequency required.

ABOUT NOTES, CAUTIONS, AND WARNINGS

In Atari publications, notes, cautions and warnings have the following meaning:

NOTE—A highlighted piece of information.

CAUTION—Equipment and/or parts can be damaged or destroyed if instructions are not followed. You will void the warranty on Atari printed-circuit boards, parts thereon, and video displays if equipment or parts are damaged or destroyed due to failure of following instructions.

WARNING—Players and/or technicians can be killed or injured if instructions are not followed.

Set-Up

How to Use This Manual

This manual is written for game operators and service personnel, and provides information for setting up, playing, testing, and maintaining your Assault™ game.

The manual is divided into the following chapters:

- Chapter 1 contains set-up and game play information.
- Chapter 2 contains self-test procedures.
- Chapter 3 contains preventive maintenance and repair procedures.
- Chapter 4 contains illustrated part lists.
- Chapter 5 contains schematic and wiring diagrams.

This chapter has information you need to set up and play your Assault game. Carefully read the information in this chapter before applying power.
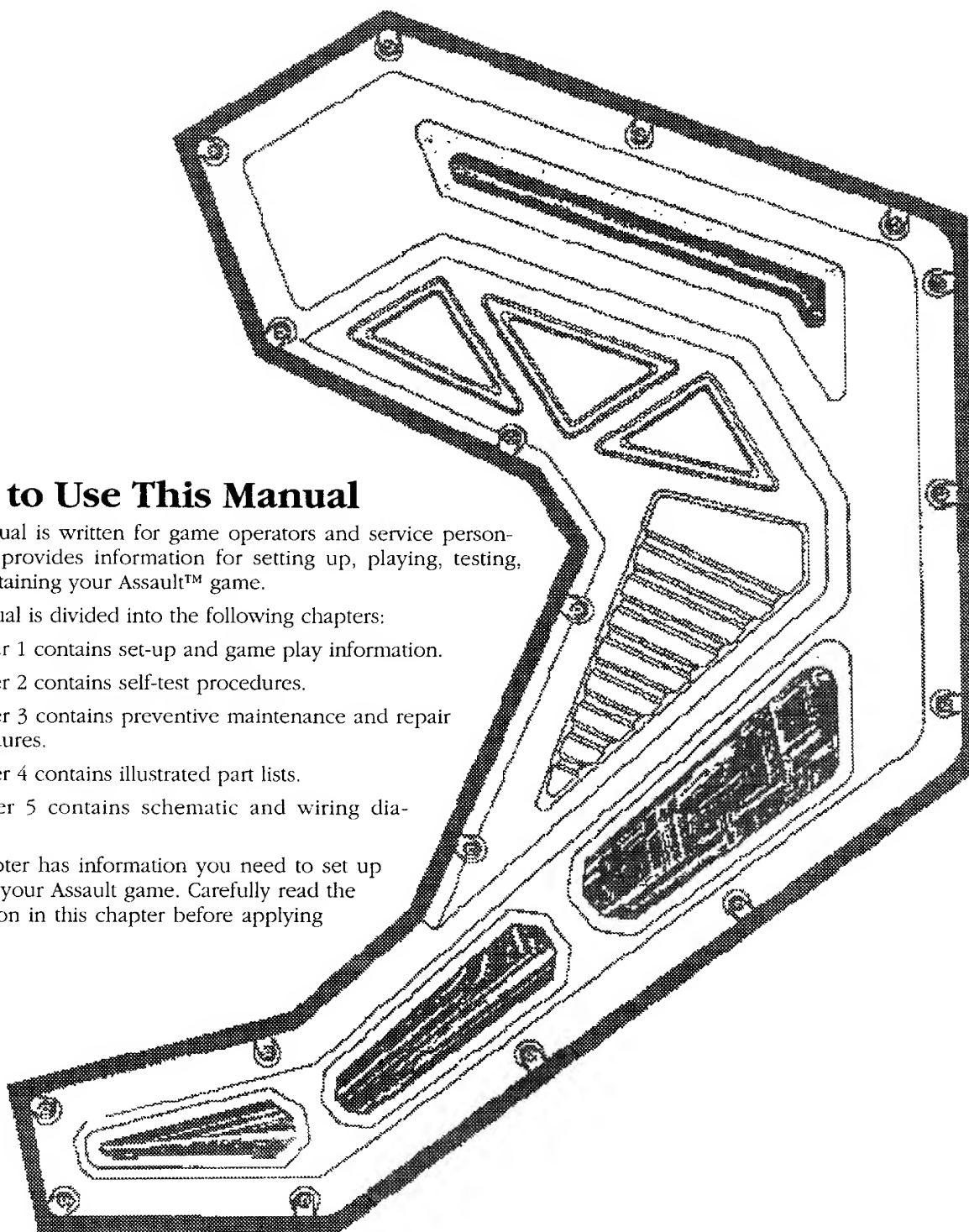
WARNING

To avoid electrical shock, do not plug in the cabinet until it has been properly inspected and set up for the line voltage in your area.

This cabinet should be connected to a grounded three-wire outlet only. If you have only two-wire outlets, we recommend that you hire a licensed electrician to install grounded outlets. Players can receive an electrical shock if the cabinet is not properly grounded.

Inspecting the Game

WARNING

Do not plug in the game until you have completed the following inspection steps.

Please inspect your Assault game carefully to ensure that the game is complete and was delivered to you in good condition.

Figure 4-1 shows the locations of the game parts. Table 1-1 lists space, power, and environmental requirements.

Inspect the game cabinet as follows:

1. Examine the exterior of the cabinet for dents, chips, or broken parts.

2. Unlock and open the service door. Unlock and open the coin doors. Inspect the interior of the cabinet as follows:

Table 1-1 Game Specifications	
Characteristic	**Specification**
Power Consumption	150 V-A, 110 W RMS
Temperature	+5° to +50° C (+37° to +122° F)
Humidity	Not to exceed 95% relative
Line Voltage	102 to 132 VAC (U.S. games)
Width	25 1/4 in. (64 cm.)
Depth	34 3/8 in. (87.3 cm.)
Height	73 1/2 in. (186.7 cm.)
Weight	290 lbs. (131.8 kg.)

a. Ensure that all plug-in connectors (on the cabinet harnesses) are firmly plugged in.

   Do not force connectors together. The connectors are keyed so they fit only in the proper orientation. *A reversed edge connector can damage a printed-circuit board (PCB) and will void your warranty.*

b. Ensure that all plug-in integrated circuits on each PCB are firmly plugged into their sockets.

c. Inspect the power cord for any cuts or dents in the insulation.

d. Inspect the power supply. Make sure that the correct fuses are installed. Check that the harness is plugged in correctly and that the fuse block cover is mounted in place. Check that the green ground wires are connected.

e. Inspect other major sub-assemblies, such as the video display, printed-circuit boards (PCBs), and speaker. Make sure that they are mounted securely and that the ground wires are connected.
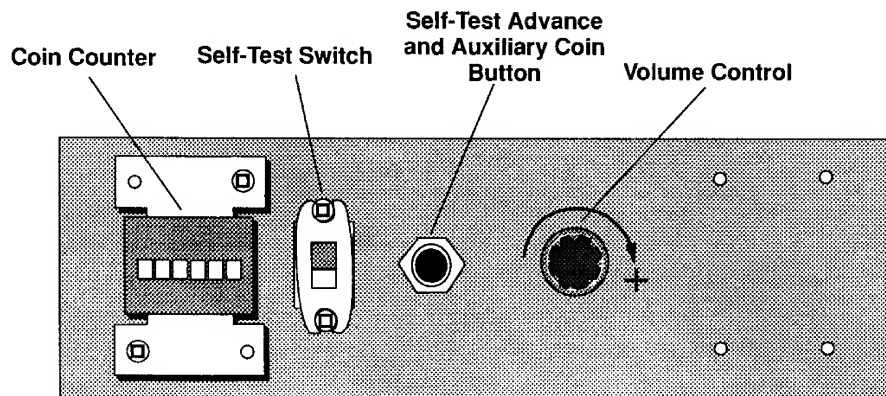
Figure 1-1 Control and Switch Locations

Controls and Switches

The Assault controls and switches are located in two places besides the on/off switch at the rear. The primary controls are on the utility panel behind the upper coin door. Additional controls are mounted on the game PCB.

Power On/Off Switch

The power on/off switch is located at the bottom rear of the cabinet. (See Figure 4-1.)

Volume Control

The volume control is located on the utility panel behind the upper coin door. (See Figure 1-1.)

You can also adjust the volume, treble, and bass by using the controls on the game PCB. Change these controls only **after** you have tried the adjustment on the utility panel. The controls on the PCB are shown in Figure 1-2. (The PCB also has a balance control, which is not used in this game since it has only one speaker.)

Self-Test Switch

The self-test switch is located on the utility panel. See Chapter 2 for a complete description of the self-test.

Auxiliary Coin Switches

The game has three auxiliary coin switches. One is the push button next to the self-test switch on the utility panel. The coin counter is not activated when you use this button. The other two switches are on the coin mechanisms. Use these auxiliary coin switches and button to give a player coin credits.

Self-Test Advance Button

To advance to the next screen in the self-test, press the push-button switch next to the self-test switch on the utility panel. See Figure 1-1. (In the attract or play mode, this is an auxiliary coin switch.)

Coin Counter

The coin counter is located on the utility panel inside the upper coin door. The coin counter records the number of coins deposited.

DIP Switch Location

The DIP switch is located on the game PCB inside the EMI enclosure. When you pull the game PCB out, you see the DIP switches as they appear in Figure 1-2.

Self-Test Switch

Turning on DIP switch 1 puts the game into the self-test mode. If you enter the self-test by turning on DIP switch 1, the only way to return to the attract or play mode is to turn switch 1 off.
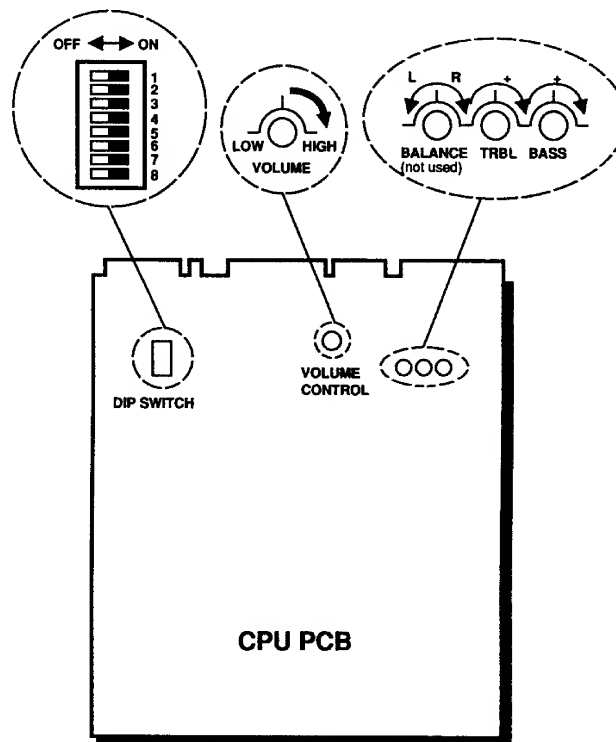
Figure 1-2 DIP Switch and Additional Volume Control Location

Statistics Switch

If you turn on DIP switches 2 and 5, the game accumulates and displays statistics in the the self-test.

Freeze Frame Switch

Turn on DIP switch 8 to freeze any video frame on the game display.

Setting the Coin and Game Options

The Assault coin and game options are set in the Self-Test Mode. Refer to Chapter 2 for the recommended settings and the procedure for setting the options.

Game Play

This section of the manual describes the theme of the Assault game and the game play features.

Introduction

Your mission is to reclaim your homeland by destroying the enemy forces that have taken over. You have an Assault tank, the supreme mobile weapon. Your tank has artillery guns and grenades, can perform Rapid Rolls to dodge enemy shots, and uses Power Wheelies to launch grenades.

Controls and Play

Your controls are two four-position joysticks with triggers. These controls make Assault like no other tank game. You have a quick, highly responsive vehicle with fast movement in all directions. To avoid enemy shots, Rapid Roll your tank left or right by moving both joysticks to the same side. To launch grenades, put the tank in the Power Wheelie position by moving

both joysticks to the outside, then pressing either trigger. Your grenades are triple the fire power of your tank's standard shots.

Your tank is always in the center of the screen no matter what direction you are going. With Assault's 360-degree scrolling playfield, the world rotates around you as you move. An arrow always points you towards the exit to the next level.

The lift zone gives you an advantage over the invaders and a spectacular view of the playfield. Each lift zone is a five-sided platform on the playfield that flashes red when you can use it. When you drive onto the lift zone, your tank jets straight up to get a bird's eye view of the surrounding terrain and enemy lines. From this overhead position, you can reconnoiter enemy forces and bomb enemy outposts.

Fight your way through 11 different levels to seek out and destroy the invader's headquarters. To succeed, you must:

- Dodge enemy gunfire with the Rapid Roll manuever.

- Assault enemy lines with long-range powerful grenades launched from Power Wheelies.

- Destroy all enemy tanks you encounter to prevent rear attacks.

- Bomb enemy outposts and reconnoiter enemy emplacements using the lift zones.

- Protect yourself against enemy artillery using buildings and trees.

- Blow up the large cannons on each level while you avoid enemy attacks.

- Follow the arrow to find the exit to the next level. Before you can exit, you must destroy the large cannons defending the enemy strongholds.

Self-Test

The Assault™ game tests itself and provides visual indications of the condition of the game circuitry and controls. Self-test information is displayed on the screen. You do not need any additional equipment.

We suggest that you perform a self-test when you first set up the game, collect coins, or when you think the game is not working correctly.

Use the self-test to check the game controls, check the game and option settings, change the game and option settings, and check the game statistics. The self-test switch is located on the utility panel behind the upper coin door. (See Figure 1-1.) The self-test advance button is the push button on the same panel.

To move from one screen to the next, push the self-test advance button on the utility panel. When you turn off the self-test switch, the game returns to the attract mode.
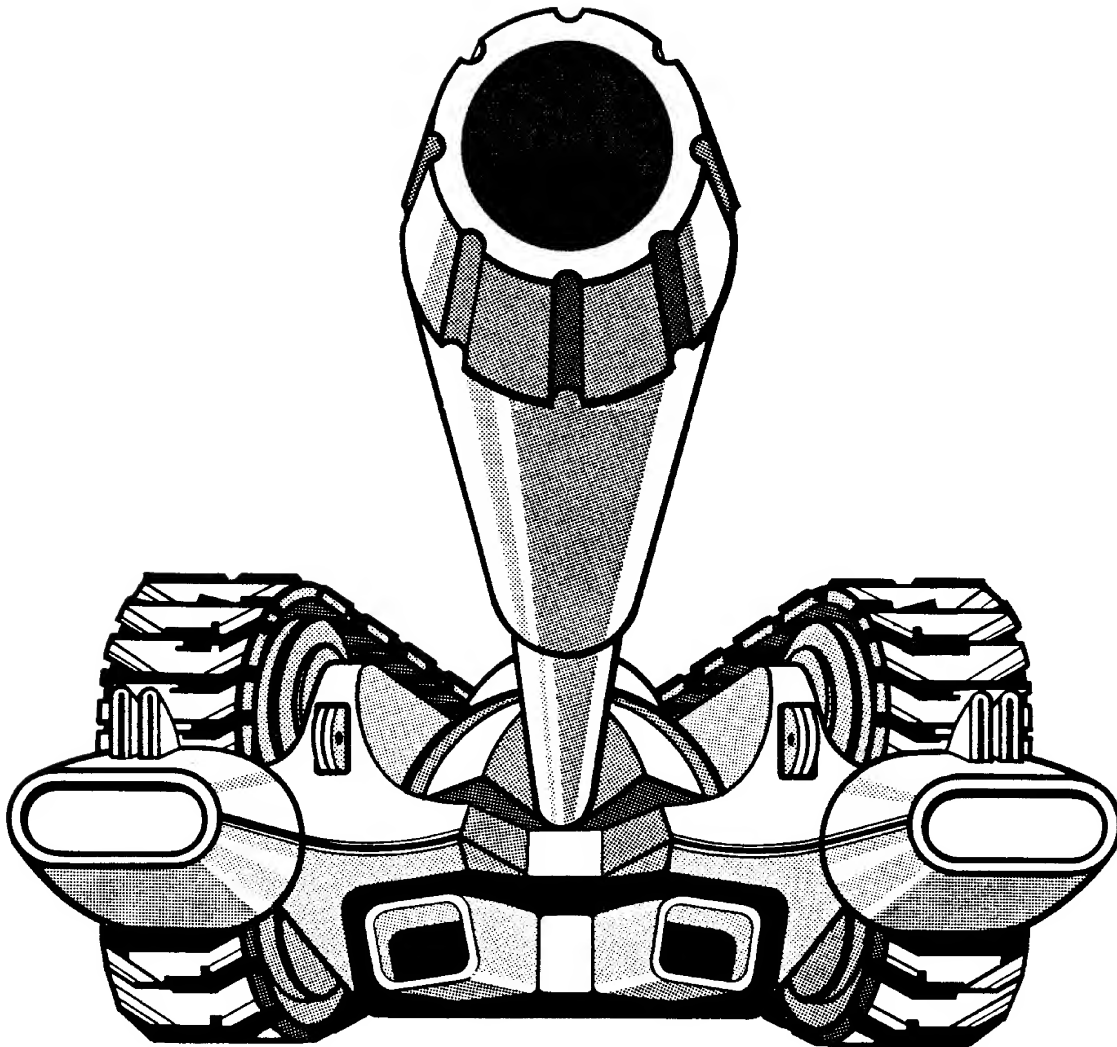
DIP Switch Settings

You may want to turn on some of the DIP switches to get more game information. The location of the DIP switches is shown in Figure 1-2.

Table 2-1 DIP Switch Settings	
Switch On	**Result**
1	Turns on self-test
2 and 5	Game collects and displays statistics
8	Freezes video frame

If you turn on switches 2 and 5, the game will accumulate and display statistics in the the self-test. If you turn on switch 1, you will go into the self-test. You can test the self-test switch on the utility panel by doing this. However, if you do enter the self-test by turning on DIP switch 1, you must leave the self-test by turning that same switch off. You can turn on DIP switch 8 to freeze any video frame in the game.

Switch Test

The first self-test screen is shown in Figure 2-1 and tests the various controls on the game. The game does not have a second set of player controls, so you cannot test START 2 or any of the PLAYER 2 controls.

NOTE TO SCREENS

Anything shaded in the screen pictures is not used in the Assault self-test. It should be ignored.

Figure 2-1 Switch Test Screen

Test game controls by moving or pressing the controls. The part name changes from white to red if it is working correctly when you test it.

If you have set any of the DIP switches on, they will be displayed in red. For more information about the DIP switches see the section above, *DIP Switch Settings.*

If you entered the self-test by switching on DIP switch 1, you can test the self-test switch on the utility panel, called TESTSW. Otherwise, TESTSW is always red.

Press down on the auxiliary coin switch on each coin mechanism to test COIN 1 and COIN 2. Press the start button to test START 1. Move the two joysticks and press the fire buttons on the joysticks to test these controls.

Game Options

Press the self-test advance button to move to this screen. Both the game options and the coin options are on this screen. This screen is shown in Figure 2-2.

Move through the screen by pushing either joystick forward or back. Change an option setting by pushing either joystick left or right.
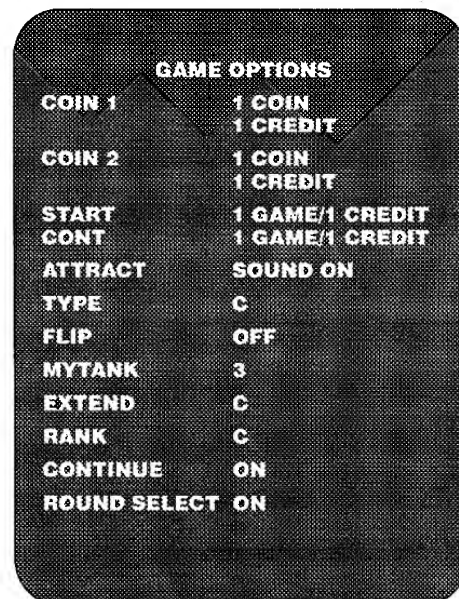
Figure 2-2 Game Options Screen

Coin 1—You can have from 1 to 9 coins and 1 to 9 credits. This sets the left coin mechanism. If you set this option setting to more than one coin, the player must put the coins in the same coin mechanism in order for the game to start.

Coin 2—You can have from 1 to 9 coins and 1 to 9 credits. This sets the right coin mechanism. If you set this option setting to more than one coin, the player must put the coins in the same coin mechanism in order for the game to start.

Start—This sets the number of credits required to begin the game. You can set this from 1 to 9 credits. The recommended setting is 1 credit.

Cont—This sets the number of credits required to continue the game. You can set this from 1 to 9 credits. The recommended setting is 1 credit.

Attract—This turns the sound in the attract mode on and off. The recommended setting is sound on.

Type—This should always be set to C. It indicates the type of cabinet you have. Your game will not work correctly if you use any other setting.

Flip—This does not apply to this game. It should always be set to OFF.

Mytank—This is the number of lives the player receives to start a game. The recommended setting is 3.

Extend—This is the number of points the player needs to receive another life and extend the game. The recommended setting is C. The settings of A, B, C, and D are shown in Table 2-2.

Table 2-4 Game Options

Coin 1*	1✦	2	3	4	5	6	7	8	9
Credits	1✦	2	3	4	5	6	7	8	9
Coin 2*	1✦	2	3	4	5	6	7	8	9
Credits	1✦	2	3	4	5	6	7	8	9
Start Coins	1✦	2	3	4	5	6	7	8	9
Credits	1✦	2	3	4	5	6	7	8	9
Cont Coins	1✦	2	3	4	5	6	7	8	9
Credits	1✦	2	3	4	5	6	7	8	9
Attract	Sound On✦			Sound Off					
Type	A	B	C✦						
Flip	On	Off✦							
Mytank	1	2	3✦	5					
Extend	A	B	C✦	D					
Rank	A	B	C✦	D					
Continue	On✦	Off							
Round Select	On✦	Off							

* If these are set to more than one coin, the player must put the coins in the same coin mechanism in order for the game to begin.

✦ Recommended settings

Table 2-2 Points Required For Extra Lives (EXTEND Settings)

Lives 1st Setting	2nd	3rd	After the 3rd life, 1 more life every
A 20,000	80,000	150,000	100,000 points
B 40,000	120,000	240,000	120,000 points
C 50,000	150,000	300,000	150,000 points
D 80,000	200,000	400,000	200,000 points

Rank—This is the number of seconds allowed in each round. The recommended setting is C. See Table 2-3.

Continue—If this is set to ON, players can continue the game at the beginning of the round that they were last on. If this is set to OFF, players must start over at Round 1 (or if Round Select is on, players can start at Round 6).

Round Select—If this is set to ON, the player can choose to start either at round 1 or at round 6. If round select is set to OFF, then the player can only start at round 1.

Sound Test

This screen tests the sound circuitry in the game. The communication test does not apply to this game, although you can see the numbers change as you push the joystick. The screen is shown in Figure 2-3.

Port Test

Nothing on this screen is used in Assault.

Convergence Test

This test indicates the condition of the display size, centering, linearity, and convergence. The screen is shown in Figure 2-4.

- The four corners of the grid pattern should touch

Table 2-3 Maximum Length of Each Round in Seconds (RANK Settings)

Round Setting	1	2	3	4	5	6	7	8	9	10	11
A	150	180	120	140	380	240	175	175	250	300	300
B	135	160	110	130	360	210	150	150	240	270	270
C	120	150	90	110	330	180	120	120	210	240	240
D	100	140	80	100	300	150	100	100	180	210	200
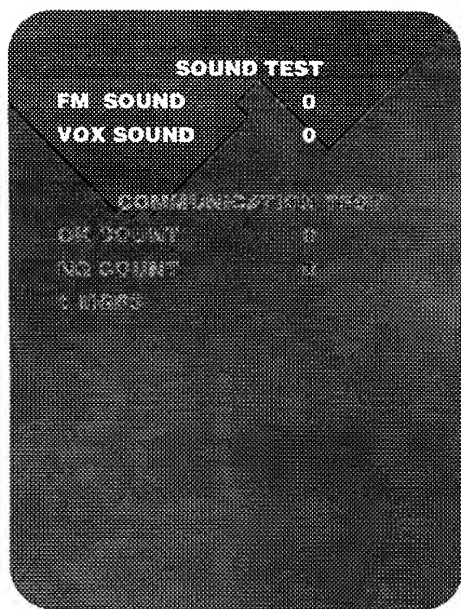
Figure 2-3 Sound Test Screen

centering, linearity, and convergence. The screen is shown in Figure 2-4.

- The four corners of the grid pattern should touch the four corners of the raster.

- Grid lines should show no pincushioning or barreling, and the lines should be straight within 3.0 mm.
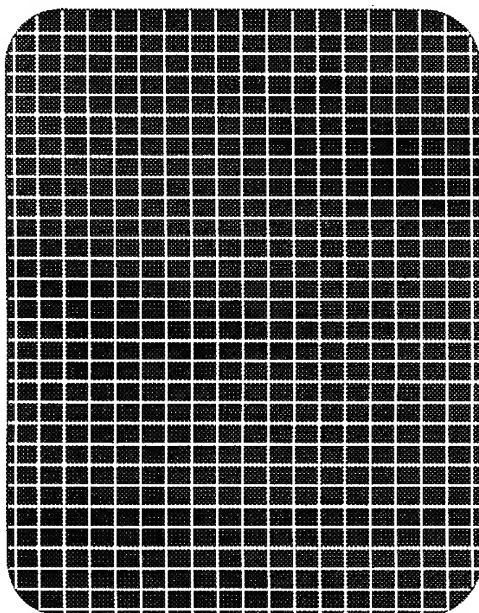
Figure 2-4 Convergence Test Screen
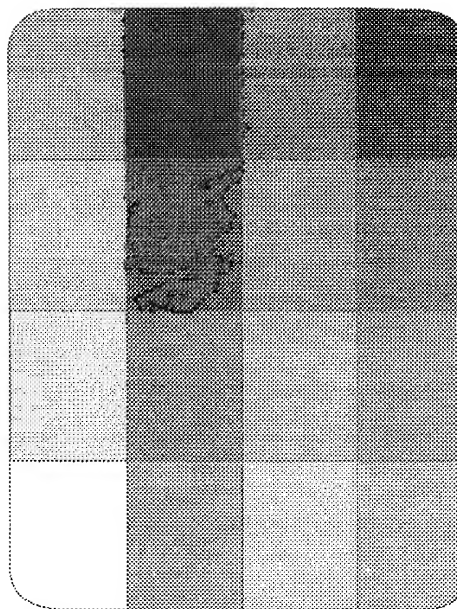
Figure 2-5 Color Test Screen

If your display does not meet these conditions, refer to the display manual that came with your game for adjustment procedures.

Color Test

The color test screen is shown in Figure 2-5. This test indicates the condition of the display color circuits.

Game Statistics

If you have DIP switches 2 and 5 set on, the game statistics screens appear after the convergence and color test screens. The location of these switches is shown in Figure 1-2.

Enter the statistical information on the statistics sheet at the back of this manual. You will have to convert some of the numbers from hexadecimal (base 16) to ordinary decimal. Follow the instructions in the section at the end of this chapter, *Converting Hexadecimal Numbers.*

First Statistics Screen: The first screen is shown in Figure 2-6 and shows these statistics:

Total Time—Total time in hours, minutes, and seconds the machine has been on since the statistics were reset or the machine was turned on.

Play Time—Total time in hours, minutes, and seconds the machine has been played since the statistics were reset or the machine was turned on.

Credit—Number of new, unique games played. Credits added to continue games are not counted. This number is in hexadecimal. See the section at the end of this chapter, *Converting Hexadecimal Numbers,* for in-
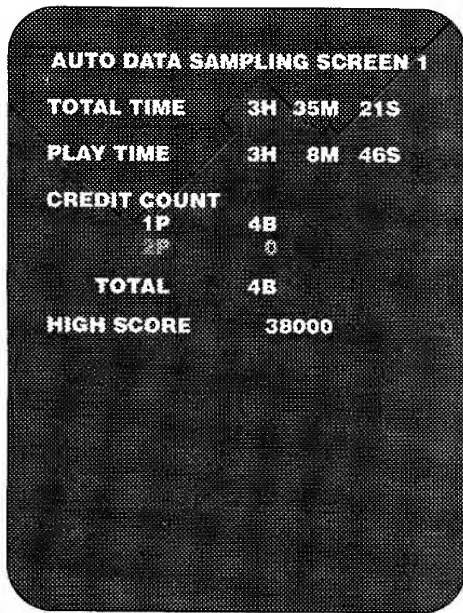
Figure 2-6 First Statistics Screen

Two player (2P) credits is not used in this game. The one player (1P) credits and the total should always be the same.

High Score—The highest score achieved since the statistics were reset or the machine was turned on.

Second Statistics Screen: Shows the round and time every player life was lost. This screen does not count when or where the game ended. The numbers on this screen are in hexadecimal. See the section at the end

of this chapter, *Reading Hexadecimal Numbers*, for information about converting hexadecimal numbers.

The screen counts time in half-minutes, up to fifteen minutes, and shows all the rounds from 1 to 11. Scroll across and down the screen using the joystick.

Third Statistics Screen: Lets you clear the statistics. If you **do not** want to clear the statistics, just leave the screen by pressing the self-test advance button or switching off the self-test switch.

If you **do** want to clear the statistics, push either joystick forward and press the fire button. This clears all the statistics.
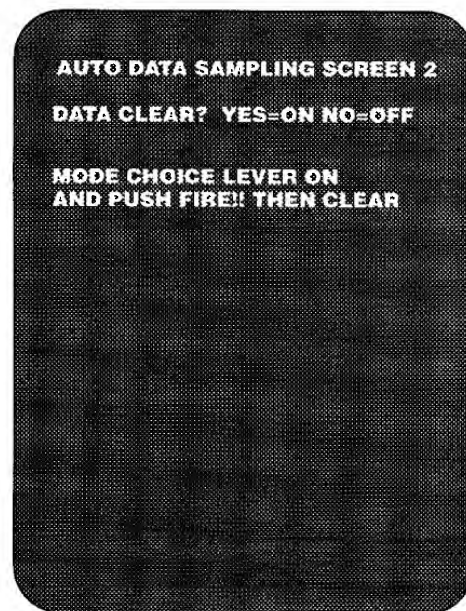
Figure 2-8 Third Statistics Screen

Converting Hexadecimal Numbers

The statistics in Assault are displayed as hexadecimal numbers (base 16), not as ordinary decimal numbers. Each number can have as many as three digits. These numbers can look like 378, A30, 78, B7, ADF, or 789*. Although some of these numbers look like ordinary decimal numbers, they are not. 378, for example, does **not** mean three hundred and seventy-eight.

Use Table 2-5 to convert the one or two-digit hexadecimal numbers to ordinary decimal numbers. If you have three-digit numbers, use the equation below the table. Enter the converted numbers on the statistics sheet at the end of this manual.

Use this procedure to convert three-digit hexadecimal

Figure 2-7 Second Statistics Screen

---

* All hexadecimal numbers are shown in this typeface

numbers to ordinary decimal numbers.

1. Use this formula:

   (_____ x 256) + (_____ x 16) + _____

2. If you have any letters, change the letters into the ordinary decimal numbers they are equal to.

3. Now multiply and add the numbers together.

For example:

1CC= (1 x 256) + (C x 16) + (C)

C equals 12 in ordinary decimal numbers, so write:

= (1 x 256) + (12 x 16) + (12)

Multiply:

= 256 + 192 + 12

And finally add:

= 460

Table 2-5 Hexadecimal-to-Decimal Conversion

Hexa-decimal	Decimal	Hexa-decimal	Decimal	Hexa-decimal	Decimal	Hexa-decimal	Decimal
00	0	40	64	80	128	C0	192
01	1	41	65	81	129	C1	193
02	2	42	66	82	130	C2	194
03	3	43	67	83	131	C3	195
04	4	44	68	84	132	C4	196
05	5	45	69	85	133	C5	197
06	6	46	70	86	134	C6	198
07	7	47	71	87	135	C7	199
08	8	48	72	88	136	C8	200
09	9	49	73	89	137	C9	201
0A	10	4A	74	8A	138	CA	202
0B	11	4B	75	8B	139	CB	203
0C	12	4C	76	8C	140	CC	204
0D	13	4D	77	8D	141	CD	205
0E	14	4E	78	8E	142	CE	206
0F	15	4F	79	8F	143	CF	207
10	16	50	80	90	144	D0	208
11	17	51	81	91	145	D1	209
12	18	52	82	92	146	D2	210
13	19	53	83	93	147	D3	211
14	20	54	84	94	148	D4	212
15	21	55	85	95	149	D5	213
16	22	56	86	96	150	D6	214
17	23	57	87	97	151	D7	215
18	24	58	88	98	152	D8	216
19	25	59	89	99	153	D9	217
1A	26	5A	90	9A	154	DA	218
1B	27	5B	91	9B	155	DB	219
1C	28	5C	92	9C	156	DC	220
1D	29	5D	93	9D	157	DD	221
1E	30	5E	94	9E	158	DE	222
1F	31	5F	95	9F	159	DF	223
20	32	60	96	A0	160	E0	224
21	33	61	97	A1	161	E1	225
22	34	62	98	A2	162	E2	226
23	35	63	99	A3	163	E3	227
24	36	64	100	A4	164	E4	228
25	37	65	101	A5	165	E5	229
26	38	66	102	A6	166	E6	230
27	39	67	103	A7	167	E7	231
28	40	68	104	A8	168	E8	232
29	41	69	105	A9	169	E9	233
2A	42	6A	106	AA	170	EA	234
2B	43	6B	107	AB	171	EB	235
2C	44	6C	108	AC	172	EC	236
2D	45	6D	109	AD	173	ED	237
2E	46	6E	110	AE	174	EE	238
2F	47	6F	111	AF	175	EF	239
30	48	70	112	B0	176	F0	240
31	49	71	113	B1	177	F1	241
32	50	72	114	B2	178	F2	242
33	51	73	115	B3	179	F3	243
34	52	74	116	B4	180	F4	244
35	53	75	117	B5	181	F5	245
36	54	76	118	B6	182	F6	246
37	55	77	119	B7	183	F7	247
38	56	78	120	B8	184	F8	248
39	57	79	121	B9	185	F9	249
3A	58	7A	122	BA	186	FA	250
3B	59	7B	123	BB	187	FB	251
3C	60	7C	124	BC	188	FC	252
3D	61	7D	125	BD	189	FD	253
3E	62	7E	126	BE	190	FE	254
3F	63	7F	127	BF	191	FF	255

Maintenance

This chapter includes preventive maintenance and re-pair procedures for the Assault™ game components that have the most use. To assure maximum trouble-free operation from this game, you should perform the preventive maintenance described in this chapter.

Removal, disassembly, re-assembly, and replacement procedures are provided for components that might need to be repaired. If a game part is mentioned, but not illustrated, refer to Chapter 4, Illustrated Parts Lists, for information.
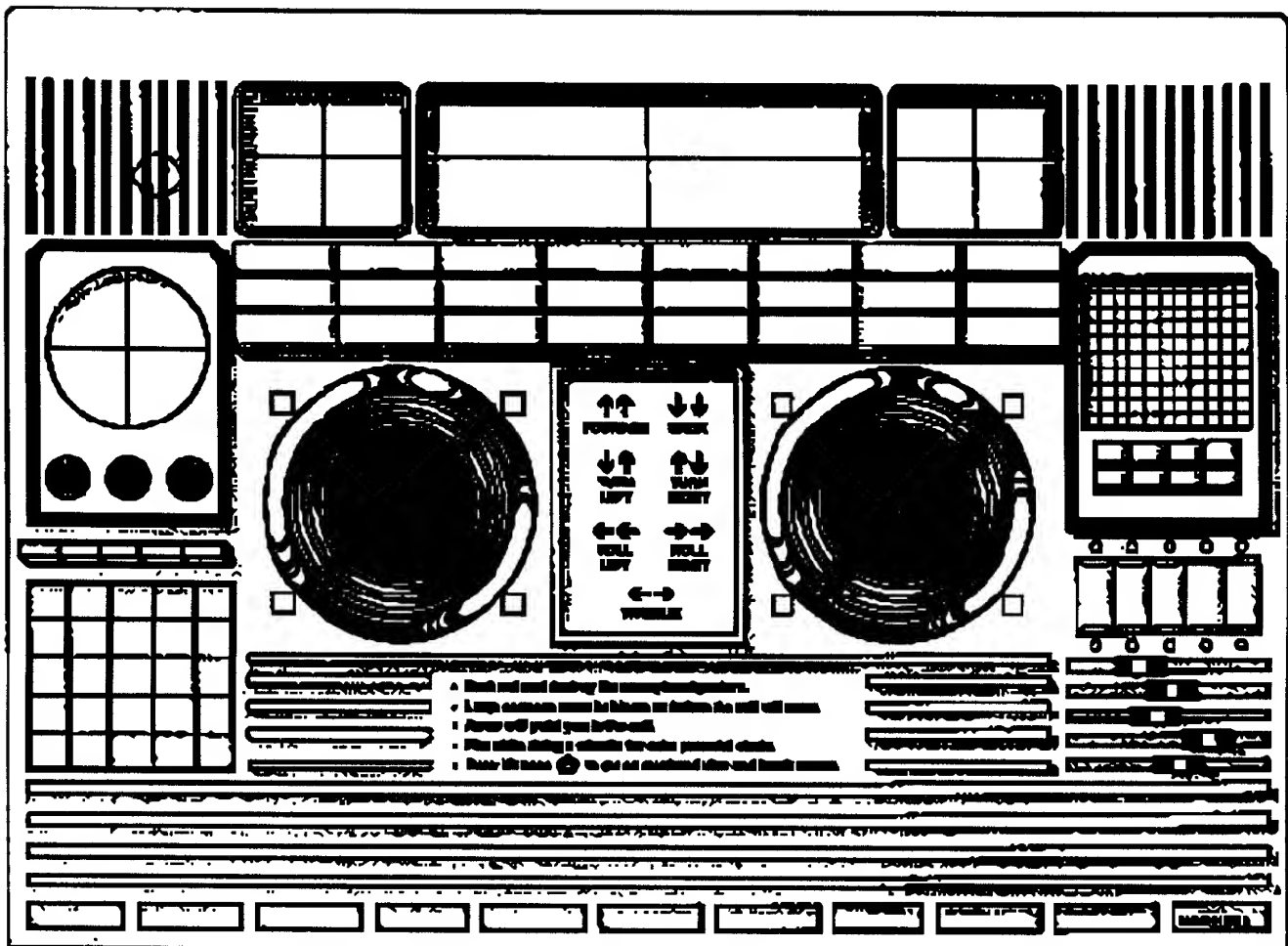
Preventive Maintenance

Preventive maintenance includes cleaning, lubricating, and tightening hardware. How often you perform preventive maintenance depends upon the game environment and frequency of play. However, you should regularly maintain the components listed in Table 3-1, Recommended Preventive-Maintenance Intervals.

WARNING

To avoid possible electrical shock, turn off the game before performing any maintenance procedures.

Preventive-Maintenance Intervals

For the best performance from your Assault game, perform the maintenance in Table 3-1 at the intervals specified.

Table 3-1 Recommended Preventive Maintenance Intervals

Joystick	Lubricate and clean every three months.
Coin Mechanism	Inspect whenever you collect coins. Clean every three months.

Opening the Control Panel

1. Open the upper coin door.
2. Reach up through the coin door and unhook the latches on either side of the control panel.
3. Pull the control panel up and disconnect the harness connector.
4. To replace the control panel, first fit the front edge into the slot in the cabinet. Reconnect the harness
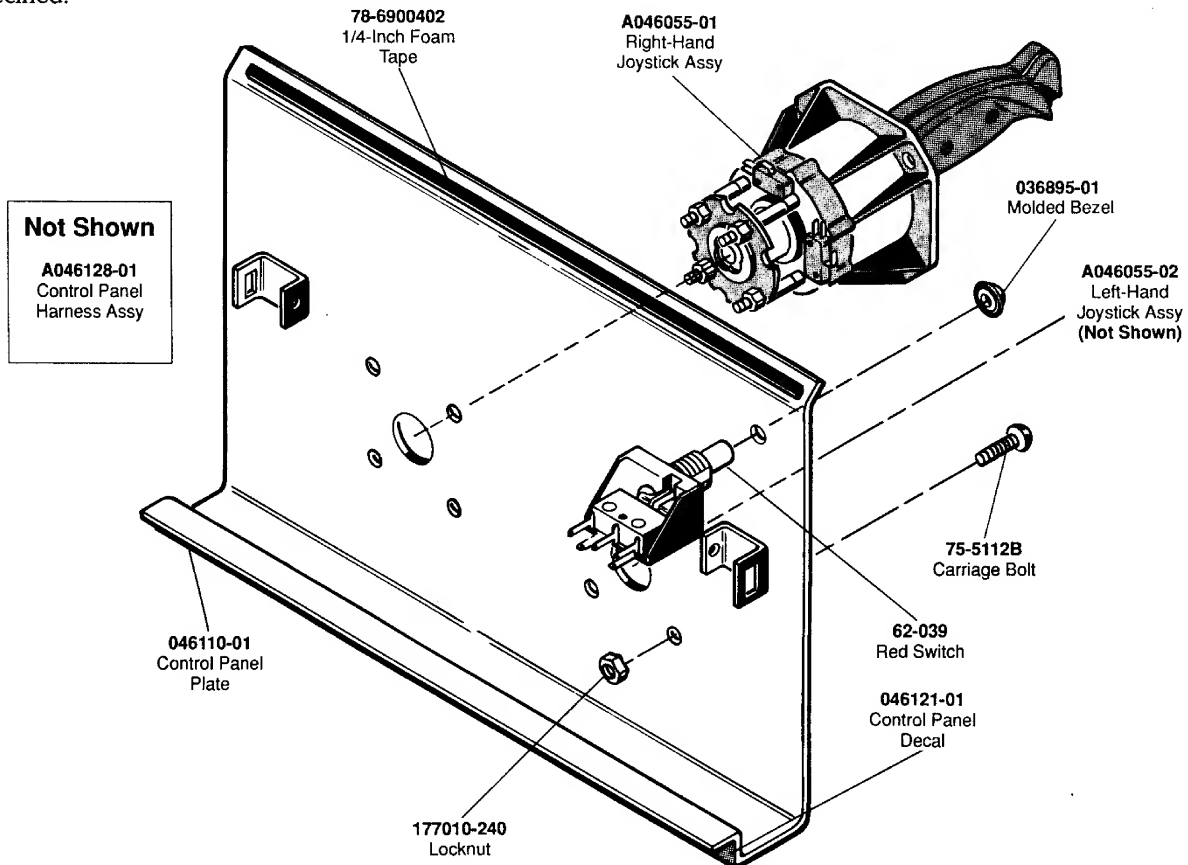
Figure 3-1 Opened Control Panel

connector. Now fit the control panel in place and hook the latches from below.

Maintaining the Joystick

Maintain the joystick by cleaning the leaf switch in the handle, inspecting the pivot and actuator balls, and lubricating the joystick with lithium grease.

Cleaning the Leaf Switch

1. Remove the control panel from the game.

2. Take the handle off each joystick by unscrewing the four tamperproof screws on the long part of the handle. See Figure 3-1.

NOTE

A hole is provided inside the upper coin door to store the tamperproof key wrench when it is not in use.

---

3. Open the handle by unscrewing the two screws on the top of the handle.

4. Inside each handle is a leaf switch. **Carefully** clean the contacts using electrical contact cleaner. Do not burnish the contacts.

5. Check the gap between the contacts. The gap should be 0.06 inches. Make sure the leaf switch blades are straight. If the gap needs to be adjusted or the blades should be straightened, see *Adjusting the Joystick Leaf Switch*, in the maintenance part of this chapter.

   If you see any cracks in the blades of the switch, replace the switch.

6. Lubricate the joystick before you put the handles back on.

Lubricating the Joystick

1. With the handles off, remove the joystick assemblies from the control panel. Use a 3/8-inch nut driver or socket to loosen the nuts that hold the joysticks on the control panel.

2. Use a 5/16-inch wrench and a screwdriver to remove the four long screws that hold the joystick together. See Figure 3-2.

3. Take off the reinforcing plate, the 8-position plate, the actuator, and the lower housing.

4. Lubricate the actuator ball on the end of the joystick shaft, the pivot ball below the upper housing, and the spring inside the upper housing. Use lithium grease.

5. Put the joystick assembly back together. Fit the pin in the pivot ball into the slot in the lower housing.

Make sure you put the reinforcing plate back on the bottom of the joystick.

6. Replace the long screws and tighten the polymer nuts.

NOTE

Do not tighten the polymer nuts on the ends of the long screws too much. If you do, the handle will be difficult to move and players may become frustrated with the game.

---

7. Replace the joystick assembly on the control panel.

8. Reinstall the joystick handles.

9. Use the Self-Test to make sure you have reassembled the joysticks correctly.

Cleaning the Coin Mechanism

Use a soft-bristled brush to remove loose dust or foreign material from the coin mechanism. A toothbrush can be used to remove any stubborn build-up of residue in the coin path. After cleaning the coin mechanism, blow out all of the dust with compressed air.

Cleaning the Interior Components

WARNING

Turn off the game power, but do not unplug the power cord before cleaning inside the cabinet. The power cord provides a ground path for stray static voltages that can be present on the cleaning tools.

Perform the following procedure to clean the components inside the cabinet.

1. Turn the game power off and wait two minutes. Unplug the power cord.

2. Remove the rear service door.

3. Discharge the high voltage from the cathode-ray tube (CRT) before proceeding. The display assembly contains a circuit for discharging the high voltage to ground when power is removed. However, to make certain, always discharge the display as follows:

72-JA4608B
6-19 Black Screw
(2 Places)

178248-001
Trigger

Inside Grip
178249-001
for Left-Hand Joystick
178249-101
for Right-Hand Joystick

Switch Bracket
178247-001
for Right-Hand Joystick
178247-002
for Left-Hand Joystick

Outside Grip
178249-003
for Left-Hand Joystick
178249-103
for Right-Hand Joystick

160050-001
Trigger Switch

176025-4106
Tamper-Proof
Screw
(4 Places)

A046132-02
Brown Jmpr Assy

A046132-01
Black Jmpr Assy

A046053-01
Upper Housing
Assy

72-1650F
3 1/8 Inches Lg
Screw

041287-01
Lower Housing

Lithium Grease

160044-001
Snap-Action
Switch

044390-01
Cushion Ring

176030-110
4-20 Screw

039714-01
Actuator

039717-01
4-Position Plate

046054-01
Reinforcing Plate

177010-236
Polymer Nut

Figure 3-2 Joystick Maintenance

WARNING

High Voltage
The video display contains lethal high voltages. To avoid injury, do not attempt to service this display until you observe all precautions necessary for working on high-voltage equipment.

X-Radiation
The video display has been designed to minimize X-radiation. However, to avoid possible exposure to soft X-radiation, never modify the high-voltage circuitry.

Implosion Hazard
The cathode-ray tube may implode if struck or dropped. Shattered glass may cause injury within a 6-foot radius. Use care when handling the display.

a. Attach a length of solid gauge wire to the blade of a well-insulated screw driver.

b. Attach the other end of the wire to an earth ground.

c. Quickly touch the blade of the screwdriver to the CRT anode by sliding it under the anode cap.

d. Wait two minutes and repeat step c.

CAUTION

Be extremely careful when cleaning the electrical components inside the cabinet. Avoid touching the electrical components with any solid object other than the soft bristles of the vacuum attachment or paint brush.

4. Use a vacuum cleaner with a soft long-bristled brush attachment or use a soft-bristled paint brush to remove loose dirt and dust accumulated on the inside of the cabinet. Be sure to clean the electrical components thoroughly (power supplies, PCB assemblies, display, etc.).

Repairs

Repairs include the removal, disassembly, re-assembly, and replacement of game components. The following procedures are provided for components that may require repairs.

Removing the Video Display

Perform the following procedure to remove the video display. (See Figure 4-1.)

1. Turn the game power off and wait two minutes. Unplug the power cord.

2. Remove the rear service door.

3. Be sure that the game power is turned off before discharging the high voltage from the cathode-ray tube (CRT). The display assembly contains a circuit for discharging the high voltage to ground when power is removed. However, to make certain, always discharge the display as follows:

   a. Attach a length of solid gauge wire to a well-insulated screw driver or wood handle.

   b. Attach the other end of the wire to an earth ground.

   c. Quickly touch the blade of the screwdriver to the CRT anode by sliding it under the anode cap.

   d. Wait two minutes and repeat step c.

4. Disconnect the display harness connectors from the display.

5. Remove the control panel from the game.

6. Insert your finger into the hole in the cabinet below the video display shield, then pull the shield out and down.

7. Remove the bezel careful from the cabinet. It is held in place with double-sided tape.

8. Remove the two wood cleats on the left and right sides of the cabinet. Use a Phillips screwdriver to remove the two screws on each side.

9. Use a 5/16-inch nut driver or socket to remove the four hex-washer head screws holding the display onto the metal mounting brackets in the cabinet.

10. Carefully lift the display out through the front of the cabinet.

WARNING

Be very careful when you remove the display from the cabinet. Do not drop it!

You should weigh at least 150 pounds to remove the display by yourself.

You should also wear gloves so you do not cut your hands on the sheet-metal edges.

11 Replace the video display as described in the following procedure.

Replacing the Video Display

Perform the following procedure to replace the video display in the cabinet. (See Figure 4-1.)

NOTE

Whenever the cathode-ray tube and yoke are replaced as a single unit, readjust the brightness, size, and centering as described in the display manual. Also check the purity and convergence according to the display manual instructions, but adjust both only if required.

---

1. Carefully lift the video display into the front of the cabinet.

2. Position the display so that the four holes in the video display mounting brackets align with the four holes in the top and bottom metal bracket.

3. Install the four hex-washer head screws through the display frame and mounting brackets.

4. Use a 5/16-inch nut driver to tighten the screws. Be sure that the display is centered horizontally.

5. Connect the display harnesses to the display.

6. Install the two cleats that support the bezel and the display shield.

7. Replace the bezel and display shield. Replace the control panel.

Adjusting the Joystick Leaf Switch

If the tank gun does not fire every time you press the trigger, then you may need to adjust the leaf switch in the joystick.

1. Remove the control panel from the game.

2. Take the handle off the joystick by unscrewing the four tamperproof screws. See Figure 3-1. Open the handle by unscrewing the two screws on the top of the handle.

3. First check the leaf switch to make sure it is clean. If it is not clean, clean it first, and see if that cures the problem.

4. The contacts should be 0.06 inches apart. If they are not, use a pinball-type leaf switch adjuster to bend the back leaf until the contacts are the correct distance apart. Be sure that the blade remains straight.

NOTE

It is easy to break the leaf switch when you are adjusting it. Be very careful when when you are bending the blades.

---

5. When the contacts are the correct distance apart, check to make sure the blades are straight. If they are not, use the leaf switch adjuster to straighten them.

5. Reassemble the handle and install it on the joystick.

Removing and Replacing the Game PC Boards

Perform the following procedure to remove or replace the Assault Video, CPU, or End PC boards.The Video and CPU PC boards are inside the EMI cage and the End PC board is on the end of the cage.

1. Turn the game power off.

2. Open and remove the service door.

3. The vertical green PC board is the End PC board. It is connected to the CPU PC board and the video PC board inside the EMI cage.The EMI cage is the perforated metal box.

4. Remove the 6 screws that hold the End PC board on the enclosure.

5. Take off the edge connectors on the End PC board.

6. Carefully pull the End PC board out, along with the CPU and the video PC boards.

7. Disconnect the CPU PC board from the End board.

CAUTION

Make sure the End PC board is tightly screwed to the EMI cage. You must use all the screws required to hold the board onto the EMI cage.

If the End board is not tight on the EMI cage, then the game may interfere with radio and television reception.

---

8. To replace the boards, reconnect and install them in the order that you removed them. Make sure the larger CPU PC board faces up, and the edge connectors on the End PC board are on top. Tightly

nectors on the End PC board are on top. Tightly screw in all the screws holding the End PC board on the EMI cage.

Replacing Static-Sensitive Devices

Be careful when you are working with static-sensitive devices on the game PC boards. Static charge that has built up in your body can cause a static-sensitive device to fail. Leakage from an improperly grounded soldering iron can also cause a static-sensitive device to fail.

Before you replace a static-sensitive device, make sure it is actually defective. A static-sensitive device can appear defective due to leakage on a PC board. To make sure a device is defective, ground any static voltages. Clean both sides of the PC board with flux remover or

an eraser. For discrete FETs, clean thoroughly between the gate, drain, and source leads. Then test the device.

If you replace a static sensitive device be careful when you handle the new static-sensitive device. The device may be packaged in conductive foam or may have a protective shorting wire attached to the pins. Remove the conductive foam just prior to inserting the device into its socket or soldering it to a PC board. Remove the shorting wire only *after* the device is inserted into its socket or *after* all the leads are soldered in place.

Removing the Speaker or Fluorescent Light

You will need an Apex A-2 square drive wrench to remove the screws holding the grill on the speaker or to remove the retainer holding the attraction panel on the cabinet.

Illustrated Parts Lists

This chapter provides information you need to order parts for your game. Common hardware parts, such as screws, nuts, washers, and so on usually are not listed in the parts lists.

The parts lists (except for the PCB parts lists) are arranged alphanumerically by Atari part number. All A-prefix numbers, which are assemblies, come first. Next are part numbers with six numbers followed by a hyphen (000598- through 201000-). Ending the list are part numbers with a two-number designation followed by a hyphen (00- through 99-).

The PCB parts lists are arranged in alphabetical order by component. Within each section the parts are arranged numerically by part number.

When you order parts, give the part number, part name, the number of this manual, and the serial number of your game. With this information, we can fill your order rapidly and correctly. We hope this will create less downtime and more profit from your games.

Atari Games Customer Service phone numbers are listed on the inside front cover of this manual.

178056-002
1/2 Inch Foam
Tape

046112-01
Bezel

046111-01
Speaker Grille

78-6900402
1/4 Inch Foam
Tape

046114-01
Retainer

171086-003
12-inch Lamp
Fixture

170003-003
Fluorescent
Lamp

046122-01
Attraction Decal

046113-01
Attraction Shield

148007-104
Speaker

046116-01
Shield

176027-4016
Washer Head
Screw

139021-002
Video Display

046084-01
Rear Service
Door

046120-02
Right Decal

A046069-01
Control Panel
Assy

171027-001
Coin Door

038091-01
Molded Coin Box

A046130-01
Utility Panel Assy

Figure 4-1 Cabinet-Mounted Assemblies, Front View
A046067-01 A

Not Shown

A046126-01
Main Harness
Assy

A046127-01
A.C. Power
Harness Assy

046120-01
Left Decal

178232-002
Lamp Retaining
Clip

178126-002
Tamperproof
Key Wrench

99-090462
CPU PCB Assy

99-090463
Video PCB Assy

046123-01
Inner Decal

A046140-01
Power Supply
Assy

A043055-01
On/Off Harness
Assy

A044991-02
End PCB Assy

EMI Enclosure

78-3201
Adjustable Glide
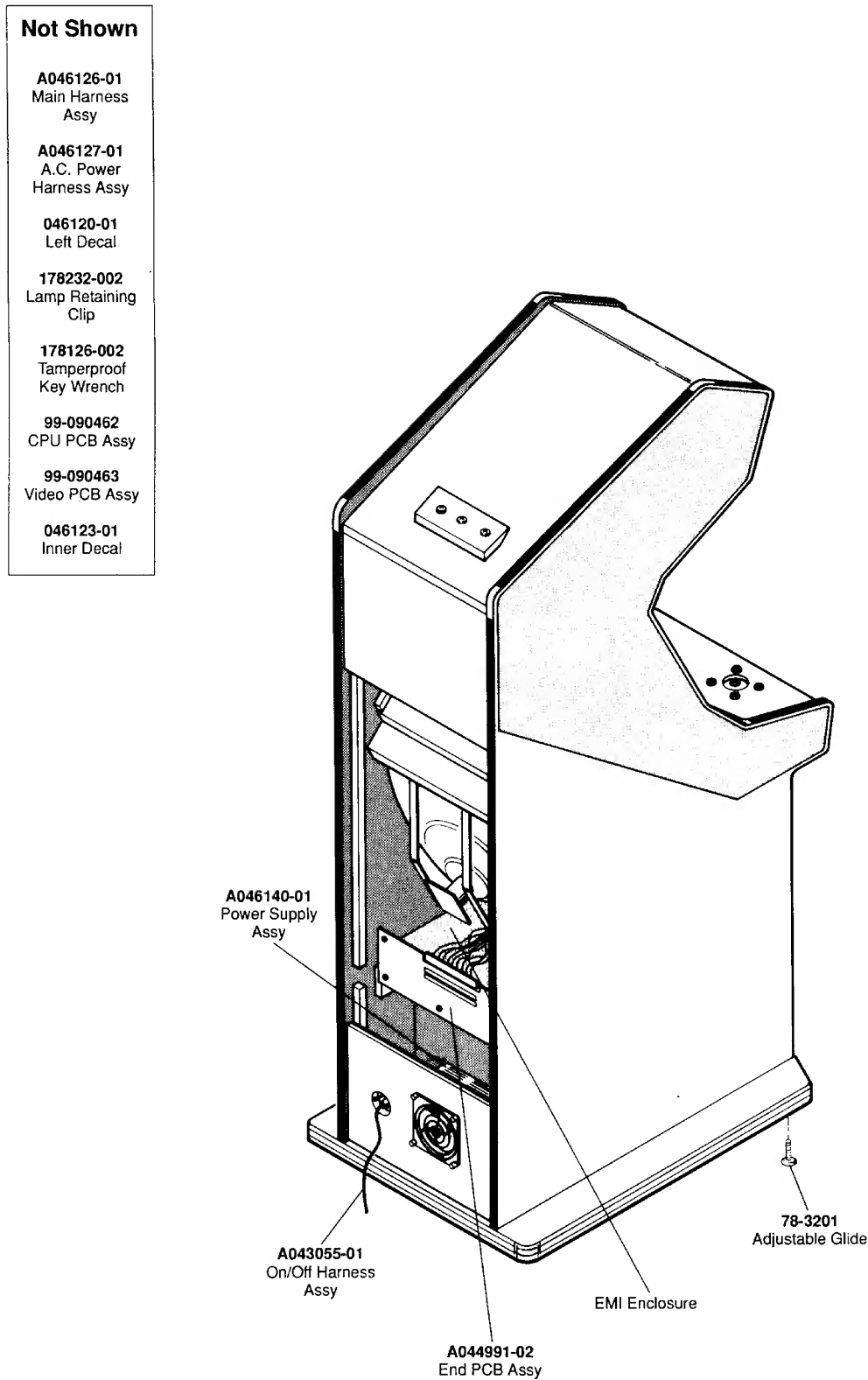
**Figure 4-1 Cabinet-Mounted Assemblies, Rear View
A046067-01 A**

Cabinet-Mounted Assemblies
Parts List

Part No.	Description
A043055-01	On/Off Harness Assembly
A044991-02	Assault End PCB Assembly
A046069-01	Control Panel Assembly (See Figure 4-2)
A046126-01	Main Harness Assembly
A046127-01	A.C. Power Harness Assembly
A046130-01	Utility Panel Assembly
A046140-01	Power Supply Assembly (See Figure 4-4)
038091-01	Molded Coin Box
046084-01	Rear Service Door
046111-01	Speaker Grille
046112-01	Video Display Bezel
046113-01	Attraction Shield
046114-01	Attraction Retainer
046116-01	Video Display Shield
046120-01	Left Decal
046120-02	Right Decal
046122-01	Attraction Decal
046123-01	Inner Decal
139021-002	19-inch, Sharp Standard-Resolution Color Video Display (Acceptable substitute is Sanyo, part no. 139021-001.)
148007-104	Speaker
170003-003	Fluorescent White 12-inch Lamp
171027-001	Over/Under 25¢/25¢ Coin Door
171086-003	12-inch Lamp Fixture (Acceptable substitute is part no. 171086-004)
176027-4016	#10-24 Hex Washer Head Screw
178056-002	1/2 Inch Wide Foam Tape
178126-002	Tamperproof Key Wrench
178232-002	Lamp Retaining Clip
78-3201	Adjustable Glide
78-6900402	1/4 Inch-Wide Foam Tape
99-090462	Assault CPU PCB Assembly (See Figure 4-6)
99-090463	Assault Video PCB Assembly (See Figure 4-7)
	The following are technical information supplements to the game:
ST-324	Assault Self-Test Label
TM-304	19-inch Sharp Standard Resolution Color Video Display Manual (If Sanyo video display is used, then TM-311 is substituted.)
TM-324	Assault Operator's Manual with Schematics
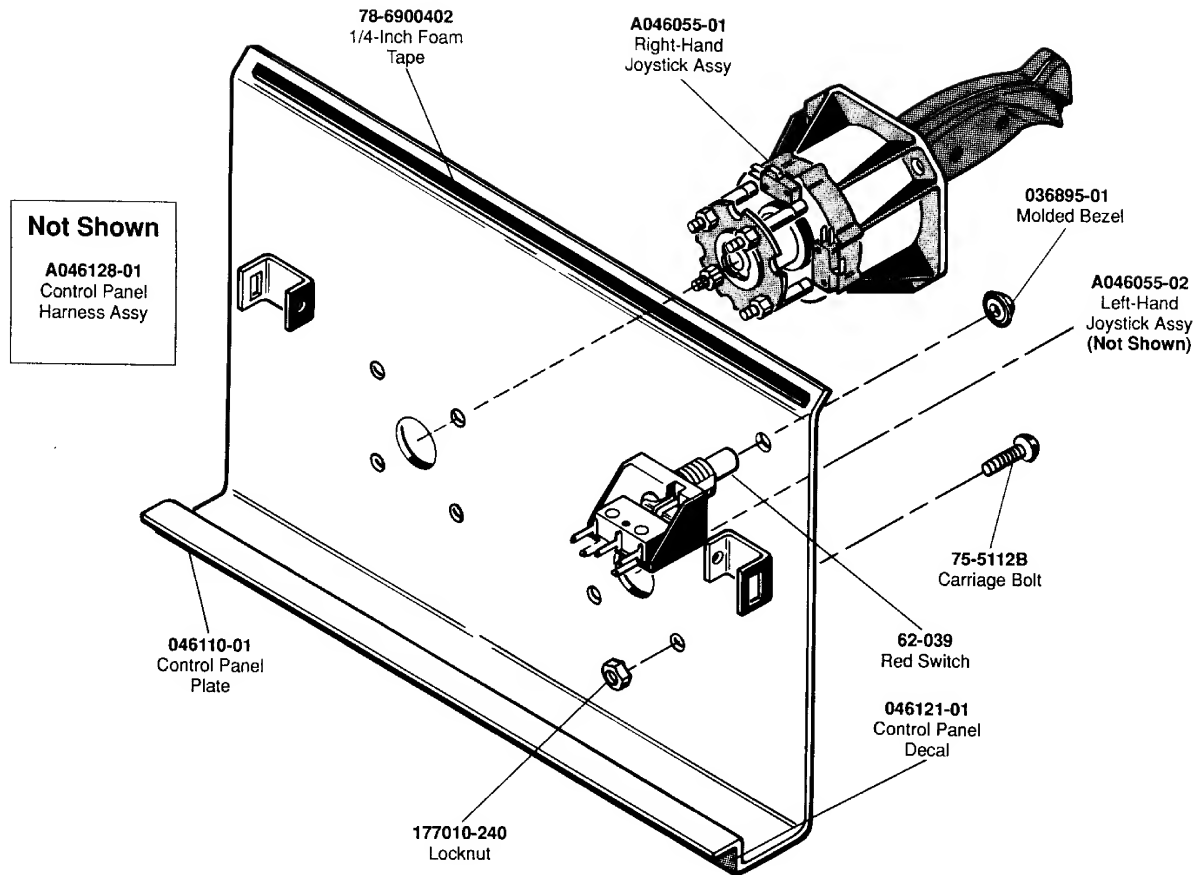
**Figure 4-2 Control Panel Assembly
A046069-01 A**

**Control Panel Assembly
Parts List**

Part No.	Description
A046055-01	Right-Hand Joystick Assembly
A046055-02	Left-Hand Joystick Assembly
A046128-01	Control Panel Harness Assembly
036895-01	Black Molded Bezel
046110-01	Control Panel Plate
046121-01	Control Panel Decal
177010-240	#10-24 Polymer Locknut
62-039	Red Cap Switch
75-5112B	#10-24 Black Carriage Bolt
78-6900402	1/2 Inch Wide Foam Tape

72-JA4608B
6-19 Black Screw
(2 Places)

178248-001
Trigger

Inside Grip
178249-001
for Left-Hand Joystick
178249-101
for Right-Hand Joystick

Switch Bracket
178247-001
for Right-Hand Joystick
178247-002
for Left-Hand Joystick

Outside Grip
178249-003
for Left-Hand Joystick
178249-103
for Right-Hand Joystick

160050-001
Trigger Switch

A046132-02
Brown Jmpr Assy

176025-4106
Tamper-Proof
Screw
(4 Places)

A046132-01
Black Jmpr Assy

A046053-01
Upper Housing
Assy

72-1650F
3 1/8 Inches Lg
Screw

041287-01
Lower Housing

Lithium Grease

160044-001
Snap-Action
Switch

044390-01
Cushion Ring

176030-110
4-20 Screw

039714-01
Actuator

039717-01
4-Position Plate

046054-01
Reinforcing Plate

177010-236
Polymer Nut

Figure 4-3 Joystick Assembly
A046055-01* and -02* B

Joystick Assembly
Parts List

Part No.	Description
A046053-01	Upper Housing Assembly
A046132-01	Black Jumper Assembly
A046132-02	Brown Jumper Assembly
039714-01	Actuator
039717-01	4-Position Plate
041287-01	Lower Housing
044390-01	Cushion Ring
046054-01	Reinforcing Plate
107027-001	Lithium Grease
160044-001	Snap-Action Switch
160050-001	Trigger Switch
176025-4106	#10-32 Tamper Proof Screw
177010-236	#6-32 Polymer Nut
178247-001	Switch Bracket For Right-Hand Joystick
178247-002	Switch Bracket For Left-Hand Joystick
178248-001	Trigger
178249-001	Inside Grip For Left-Hand Joystick
178249-003	Outside Grip For Left-Hand Joystick
178249-101	Inside Grip For Right-Hand Joystick
178249-103	Outside Grip For Right-Hand Joystick
72-1650F	#6-32 Screw, 3 1/8 Inches Long
72-JA4608B	#6-19 Black Self-Tapping Screw

* *A046055-01 is the right-hand joystick assembly. A046055-02 is the left-hand joystick assembly.*

A043367-08
12-Inch Black Jumper
Assy

179231-002
2-Position Terminal Block

A043367-09
12-Inch White Jumper
Assy

043396-01
Power Supply Base

149008-001
Hitron 5V/12V Switching
Power Supply Assy

A042384-01
RFI Filter Assy

46-2013002
3 A, 250 V, Slow-Blow
Fuse

179225-2201
1-Position Fuse Block

A043367-01
3-Inch Black Jumper
Assy

034544-01
Fuse Block Cover

A044337-01
Transformer
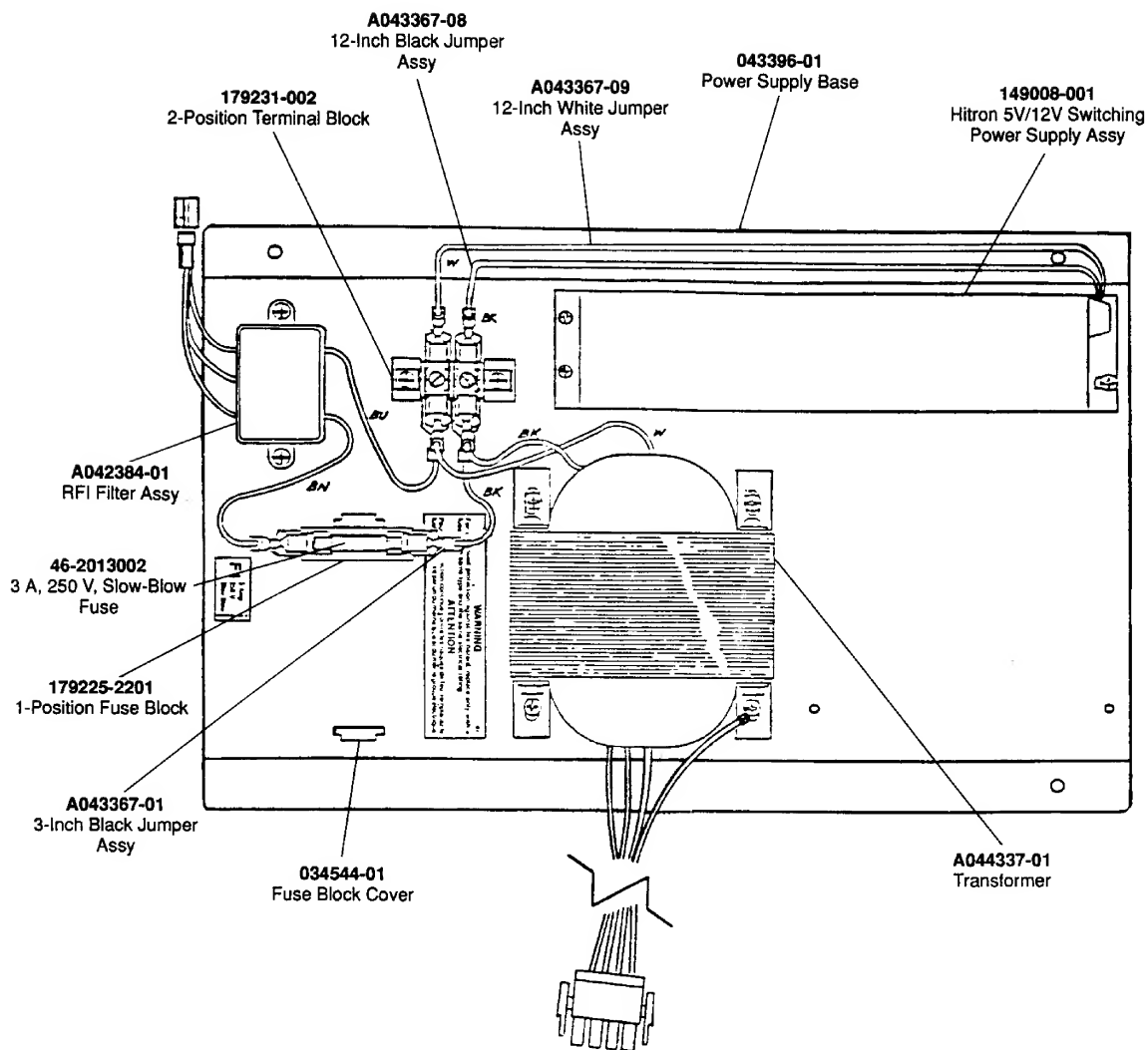
Figure 4-4 Switching/Linear Power Supply Assembly
A046140-01 A

Switching/Linear Power Supply Assembly
Parts List

Part No.	Description
A042384-01	RFI Filter Assembly
A043367-01	3-Inch Black Jumper Assembly
A043367-08	12-Inch Black Jumper Assembly
A043367-09	12-Inch White Jumper Assembly
034544-01	Fuse Block Cover
043396-01	Power Supply Base
A044337-01	Transformer with Termination Assembly
149008-001	Hitron 5V/12V Switching Power Supply Assembly—see below
179225-2201	1-Position Fuse Block
179231-002	2-Position Terminal Block
46-2013002	3 A, 250 V, Slow-Blow Fuse

Hitron 5V/12V Power Supply Sub-Assembly
Parts List

Part No.	Description
	Capacitors
99-211036	Capacitor, Metal Film, 0.047 μf, 250V
99-211037	Capacitor, Metal Film, 0.22 μf, 100V
99-211038	Capacitor, Metal Film, 0.1 μf, 400V
99-211039	Capacitor, Metal Film, 0.022 μf, 100V
99-211040	Capacitor, Ceramic, 1800pf, 2 KV, Z5V
99-211041	Capacitor, Ceramic, 0.01uf, 1 KV, Z5U
99-211042	Capacitor, Ceramic, 0.001 μf, 2 KV
99-211043	Capacitor, Ceramic, 470 Pf, 1KV, Z5P
99-211046	Capacitor, Electrolytic, 100 μf, 200V
99-211047	Capacitor, Electrolytic, 1000 μf, 25V
99-211079	Capacitor, DE7100F22M
99-211080	Capacitor, 1000 μf, 35V
99-211081	Capacitor, 470 μf, 25V
99-211082	Capacitor, 220 μf, 16V
	Diodes
99-211005	Diode, Schottky, S10SC4M
99-211007	Diode, Zener, 1N752A
99-211008	Diode, Rectifier, 1N4006
99-211009	Diode, Fast Recovery, RPG10B
99-211010	Diode, Fast Recovery, RPG10K
99-211011	Diode, Fast Recovery, RPG15B
99-211012	Diode, Switching, 1N4148
99-211076	Diode, 31DQ04

Hitron 5V/12V Power Supply Sub-Assembly
Parts List, Continued

Part No.	Description
	Inductors
99-211084	Inductor, 8 µh
99-211085	Inductor, 9.8 µh
99-211086	Inductor, 0.75 mh
99-211087	Inductor, 2.2 µh
99-211088	Inductor, 60 mh
	Resistors
99-211014	Potentiometer, Trimming, 3K Ohm
99-211016	Resistor, Wire Wound, 150 Ohm, ±5%, 2W
99-211017	Resistor, Wire Wound, 33 Ohm, ±5%, 2W
99-211018	Resistor, Wire Wound, 0.47 Ohm, ±5%, 2W
99-211019	Resistor, Wire Wound, 120 Ohm, ±5%, 2W
99-211020	Thermistor, 0.5 Ohm, ±5%, 5W
99-211021	Resistor, 2.2K Ohm, ±2%, 1/4W
99-211023	Resistor, Carbon Film, 270 Ohm, ±5%, 1/2W
99-211024	Resistor, Carbon Film, 470 Ohm, ±5%, 1/4W
99-211025	Resistor, Carbon Film, 47 Ohm, ±5%, 1/4W
99-211026	Resistor, Carbon Film, 330 Ohm, ±5%, 1/4W
99-211027	Resistor, Carbon Film, 5.6 Ohm, ±5%, 1/4W
99-211028	Resistor, Carbon Film, 8.2 Ohm, ±5%, 1/4W
99-211029	Resistor, Carbon Film, 10 Ohm, ±5%, 1/4W
99-211030	Resistor, Carbon Film, 39 Ohm, ±5%, 1/4W
99-211031	Resistor, Carbon Film, 56 Ohm, ±5%, 1/4W
99-211032	Resistor, Carbon Film, 1K Ohm, ±5%, 1/4W
99-211033	Resistor, Metal Film, 2K Ohm, ±2%, 1/4W
99-211035	Resistor, Carbon Film, 2K Ohm, ±5%, 1/4W
99-211077	Resistor, 470 Ohm, 1/2W, ±5%
99-211078	Resistor, 120K Ohm, 1W, ±5%
	Transistors
99-211002	Transistor, NPN, 2SC1413A
99-211003	Transistor, NPN, PE8050B
	Miscellaneous
99-211059	Heat Sink
99-211061	Heat Sink, 1.5mm
99-211089	Transformer, 4.75 mh
99-211083	Transformer, Power
99-211001	Regulator, UA431AWC
99-211013	Rectifier, Silicon-Controlled, S2800

N O T E S

99-10140
Panel Assembly

75-948S
Locknut

99-10152
Right Coin Inlet

99-10116
Lever

99-10147
Harness

171006-035
Coin Mechanism

75-944 S
Locknut

99-10096
Fastener

99-10151
Left Coin Inlet

7011-47
Lamp

99-10080
Lamp Socket

72-9406S
Screw

99-10105
Bar

99-10104
Bar Retainer

99-10154
Bracket Assembly

99-10042 thru 99-10045
Coin Switch Assembly

99-10153
Coin Return Box

99-10150
Switch Cover

99-10068
Coin Chute

65-441C
Coin Switch

99-10075 thru 99-10078
Switch Wires

99-10008
Retainer

75-1412S
Screw

**Figure 4-5   Coin Acceptors, Inc. Coin Door Assembly
171027-001 A**

99-10148
Lock Assembly

99-10160
Coin Inlet Housing

72-HA1404C
Screw

99-10139
Coin Door

99-10161
Side Entry Button Assy

99-10148
Lock Assembly

99-10115
Spring

99-10141
Coin Return Cover

99-10117
Coin Return Door

72-JA1405B
Screw

99-10144
Channel Clip

99-15066
Screw

99-10149
Service Door

038091-01
Coin Box

99-10143
Frame

NOTE

The acceptable substitute for this door (and the one used in games manufactured in Ireland) is the Coin Controls Ltd. Coin Door Assembly, part number 171034-001. You can obtain a free Coin Controls Ltd. supplement (part. no. CO-305-01) that has illustrations and a parts list. Write to Atari Games Ireland Limited, Tipperary Town, Ireland. Telephone 062-52155.

Figure 4-5   Coin Acceptors, Inc. Coin Door Assembly, Continued
171027-001 A

Coin Acceptors, Inc. Coin Door Assembly
Parts List

Part No.	Description
65-441C	Coin Switch
70-11-47	Miniature Bayonet Lamp
72-9406S	#4-40 x 3/8-Inch Truss-Head Screw
72-HA1404C	#4-40 x 1/4-Inch Pan-Head Screw
72-JA1405B	#4-40 x .31-Inch Pan-Head Screw
75-1412S	#4-40 x 3/4-Inch Pan-Head Screw
75-994S	#4-40 Locknut
99-10008	Retainer
99-10042	Coin Switch Assembly for Belgian 5 Fr and U.S. 25¢
99-10043	Coin Switch Assembly for German 1 DM, Japanese 100 Yen, Swiss 1 Fr
99-10044	Coin Switch Assembly for German 2 DM, Italian 100 L, U.S. $1.00
99-10045	Coin Switch Assembly for Australian $.20, German 5 DM, British 10 P
99-10068	Coin Return Chute
99-10075	Switch Wire (included in coin switch assembly 99-10043)
99-10076	Switch Wire (included in coin switch assembly 99-10042)
99-10077	Switch Wire (included in coin switch assembly 99-10044)
99-10078	Switch Wire (included in coin switch assembly 99-10045)
99-10080	Lamp Socket
99-10081	Key Holder
99-10096	Fastener
99-10104	Bar Retainer
99-10105	Bar
99-10115	Spring
99-10116	Plastic Coin Return Lever
99-10117	Steel Coin Return Door
99-10139	Coin Door
99-10140	Coin Door Inner-Panel Assembly
99-10141	Die-Cast Coin Return Cover
99-10143	Coin Door Frame
99-10144	Channel Clip
99-10147	Harness
99-10148	Lock Assembly
99-10149	Service Door
99-10150	Switch Cover
99-10151	Left Coin Inlet
99-10152	Right Coin Inlet
99-10153	Coin Return Box
99-10154	Bracket Assembly
99-10160	1-Inch Wide Die-Cast Coin Inlet Housing
99-10161	25¢ Amber Side-Entry Coin Button Assembly
99-15066	Screw for Clamp
171006-035	Metal Coin Mechanism for U.S. 25¢

N   O   T   E   S
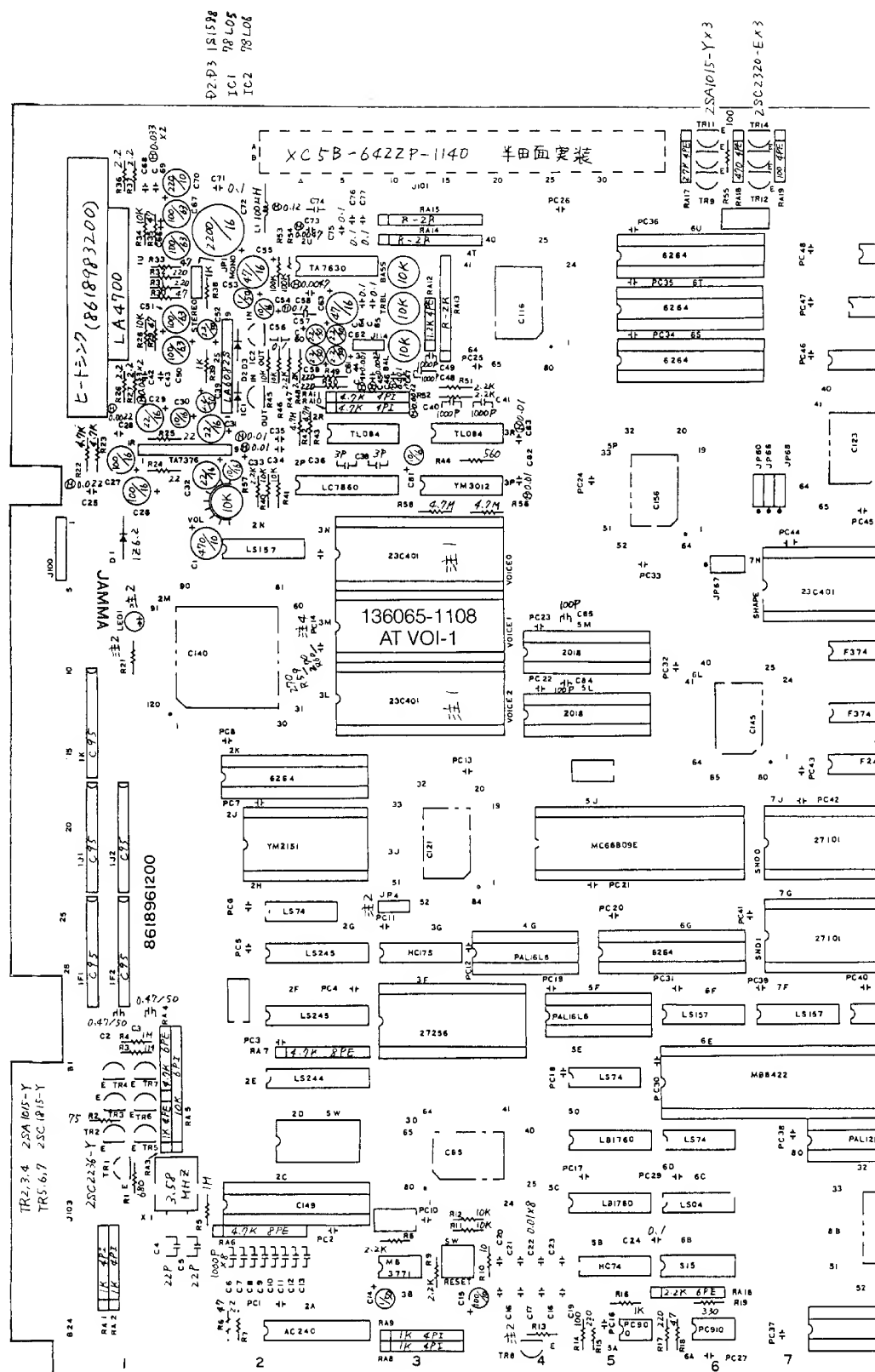
Figure 4-6 Assault CPU PCB Assembly
99-090462
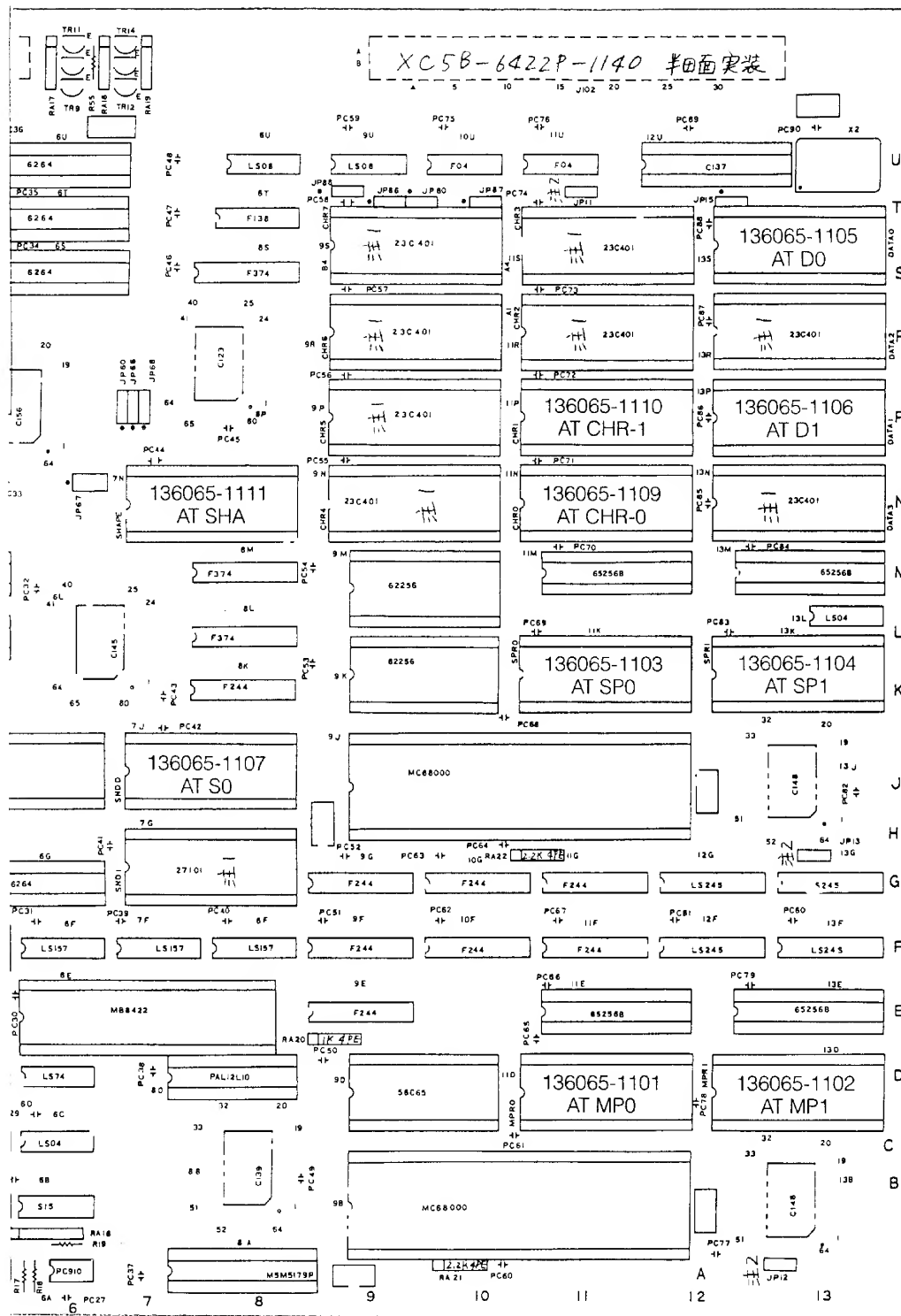
Figure 4-6 Assault CPU PCB Assembly, Continued
99-090462

Assault CPU PCB Assembly
Parts List

Part No.	Description
	Capacitors
99-090172	Capacitor, Ceramic, 100pF, 25V
99-090411	Capacitor, Ceramic, 1000pF, 25V
99-090412	Capacitor, Ceramic, 3pF, 25V
99-090171	Capacitor, Ceramic, 22pF, 25V
99-090174	Capacitor, Ceramic, 0.01µF, 25V
99-090175	Capacitor, Ceramic, 0.1µF, 25V
99-090413	Capacitor
99-090414	Capacitor, Ceramic, 0.001µF, 50V
99-090415	Capacitor, Ceramic, 0.0022µF, 50V
99-090266	Capacitor, Ceramic, .0047µF, 50V, ±10%
99-090416	Capacitor, Ceramic, 0.022µF, 50V
99-090180	Capacitor, Ceramic, .033µF, 50V, ±10%
99-090417	Capacitor, Ceramic, 0.12µF, 50V
99-090267	Capacitor, Ceramic, .01µF, 50V, ±10%
99-090418	Capacitor, Electrolytic, 1µF, 50V
99-090419	Capacitor, Electrolytic, 2.2µF, 50V
99-090269	Capacitor, Electrolytic, 10µF, 16V
99-090347	Capacitor, Electrolytic, 22µF, 16V
99-090270	Capacitor, Electrolytic, 47µF, 16V
99-090420	Capacitor, Electrolytic, 100µF, 10V
99-090273	Capacitor, Electrolytic, 100µF, 16V
99-090421	Capacitor, Electrolytic, 220µF, 10V
99-090422	Capacitor, Electrolytic, 470µF, 10V
99-090423	Capacitor, Electrolytic, 2200µF, 16V
99-090424	Capacitor, Electrolytic, 100µF, 6.3V
99-090350	Capacitor, Electrolytic, .47µF, 50V
	Integrated Circuits
136065-1101	Integrated Circuit, EPROM, AT MP0, 11D
136065-1102	Integrated Circuit, EPROM, AT MP1, 13D
136065-1103	Integrated Circuit, EPROM, AT SP0, 11K
136065-1104	Integrated Circuit, EPROM, AT SP1, 13K
136065-1105	Integrated Circuit, EPROM, AT D0, 13S
136065-1106	Integrated Circuit, EPROM, AT D1, 13P
136065-1107	Integrated Circuit, EPROM, AT S0, 7J
136065-1108	Integrated Circuit, ROM, AT VOI-1, 3M
136065-1109	Integrated Circuit, ROM, AT CHR-0, 11N
136065-1110	Integrated Circuit, ROM, AT CHR-1, 11P
136065-1111	Integrated Circuit, EPROM, AT SHA, 7N
99-090110	Integrated Circuit, 74LS04
99-090111	Integrated Circuit, 74LS08
99-090115	Integrated Circuit, 74LS74
99-090120	Integrated Circuit, 74LS157
99-090244	Integrated Circuit, 74LS244
99-090124	Integrated Circuit, 74LS245
99-090288	Integrated Circuit, 74F04

Assault CPU PCB Assembly
Parts List, Continued

Part No.	Description
99-090313	Integrated Circuit, 74F138
99-090314	Integrated Circuit, 74F244
99-090315	Integrated Circuit, 74F374
99-090362	Integrated Circuit, 74S15
99-090363	Integrated Circuit, 74AC240
99-090364	Integrated Circuit, 74HC74
99-090291	Integrated Circuit, 74HC175
99-090365	Integrated Circuit, CPU, HD68000-12
99-090366	Integrated Circuit, CPU, MC68000G12
99-090367	Integrated Circuit, CPU, 68B09EP
99-090368	Integrated Circuit, CPU, HD68B09E
99-090136	Integrated Circuit, TMM2018D-45 (45NS)
99-090369	Integrated Circuit, RAM, MB8464A-15-SK
99-090370	Integrated Circuit, RAM, MPD4364CX-15
99-090371	Integrated Circuit, RAM, HM6225GP-120
99-090372	Integrated Circuit, RAM, M5M5256AP-12
99-090373	Integrated Circuit, RAM, MPD4325GC-120
99-090374	Integrated Circuit, RAM, SRM2025GLC12
99-090375	Integrated Circuit, RAM, MB84256-10
99-090376	Integrated Circuit, RAM, M5M5178-55
99-090377	Integrated Circuit, RAM, M5M5179-55
99-090378	Integrated Circuit, RAM, MB8422-12
99-090379	Integrated Circuit, RAM, HM6525GBSP-12
99-090380	Integrated Circuit, PAL, 16L8, SYS87B-1
99-090381	Integrated Circuit, PAL, 16L8, SYS87B-2
99-090382	Integrated Circuit, PAL, 12L10-2, SYS87B-3
99-090383	Integrated Circuit, EEPROM, HN58C65P-25
99-090155	Integrated Circuit, Custom 95
99-090300	Integrated Circuit, Custom 116
99-090303	Integrated Circuit, Custom 121
99-090318	Integrated Circuit, Custom 123
99-090384	Integrated Circuit, Custom 137
99-090385	Integrated Circuit, Custom 139
99-090386	Integrated Circuit, Custom 140
99-090387	Integrated Circuit, Custom 145
99-090388	Integrated Circuit, Custom 148
99-090389	Integrated Circuit, Custom 149
99-090390	Integrated Circuit, Custom 156
99-090391	Integrated Circuit, Custom 65
99-090248	Integrated Circuit, Op-Amp, TL084CN
99-090392	Integrated Circuit, Op-Amp, LA6082S
99-090393	Integrated Circuit, Audio Amp, LA4700
99-090147	Integrated Circuit, YM2151
99-090158	Integrated Circuit, DAC, YM3012
99-090394	Integrated Circuit, DAC, LC7880
99-090322	Integrated Circuit, TA7630

Assault CPU PCB Assembly
Parts List, Continued

Part No.	Description
99-090395	Integrated Circuit, TA7376
99-090324	Integrated Circuit, MB3771
99-090396	Integrated Circuit, Voltage Regulator, 78L05
99-090320	Integrated Circuit, 78L06
99-090323	Integrated Circuit, LB1760
99-090398	Integrated Circuit, PC900
99-090399	Integrated Circuit, PC910

Resistors

Part No.	Description
99-090351	Potentiometer,10K Ohm
99-090309	Resistor, SIP,1K Ohm
99-090305	Resistor, SIP,100 Ohm, 1/8W
99-090307	Resistor, SIP,470 Ohm, 1/8W
99-090332	Resistor, SIP,1K Ohm, 1/8W
99-090461	Resistor, SIP,4.7K Ohm, 1/8W
99-090333	Resistor, SIP,1.2K,1/8W
99-090252	Resistor, SIP,2.2K Ohm X 4, 1/8W
99-090401	Resistor, SIP,2.2K Ohm, 1/8W
99-090306	Resistor, SIP,2.7K Ohm, 1/8W
99-090185	Resistor, SIP,4.7K Ohm X 8, 1/8W
99-090183	Resistor, SIP,1K Ohm X 4, 1/8W
99-090402	Resistor, SIP,4.7K Ohm, 1/8W
99-090336	Resistor, SIP,10K Ohm, 1/8W
99-090403	Resistor, 2.2 Ohm, 1/4W
99-090404	Resistor, 10 Ohm, 1/4W
99-090405	Resistor, 22 Ohm, 1/4W
99-090406	Resistor, 47 Ohm, 1/4W
99-090407	Resistor, 75 Ohm, 1/4W
99-090255	Resistor, 100 Ohm, ±5%, 1/4W
99-090408	Resistor, 220 Ohm, 1/4W
99-090189	Resistor, 330 Ohm, ±5%, 1/4W
99-090192	Resistor, 560 Ohm, ±5%, 1/4W
99-090188	Resistor, 680 Ohm, ±5%, 1/4W
99-090193	Resistor, 1K Ohm, ±5%, 1/4W
99-090257	Resistor, 2.2K Ohm, ±5%, 1/4W
99-090194	Resistor, 4.7K Ohm, ±5%, 1/4W
99-090196	Resistor, 10K Ohm, ±5%, 1/4W
99-090331	Resistor, 100K Ohm, 1/4W, ±5%
99-090199	Resistor, 1M Ohm, ±5%, 1/4W
99-090409	Resistor, 4.7M Ohm, 1/4W
99-090410	Resistor, 270 Ohm, 1/8W

Transistors

Part No.	Description
99-090328	Transistor, 2SC2236-Y
99-090310	Transistor, 2SA1015-Y
99-090397	Transistor, 2SC1815-Y
99-090311	Transistor, 2SC2320-E

Assault CPU PCB Assembly
Parts List, Continued

Part No.	Description
	Miscellaneous
99-090326	Diode, 1Z6.2
99-090250	Diode, 1S1588
99-090163	Crystal, 3.579545 Mhz
99-090161	Oscillator, KXO-01-49M152
99-090162	Oscillator, MCO-1425B (49.152 Mhz)
99-090274	Inductor, 100μH, SP0406-101K

Figure 4-7 Assault Video PCB Assembly
99-090463
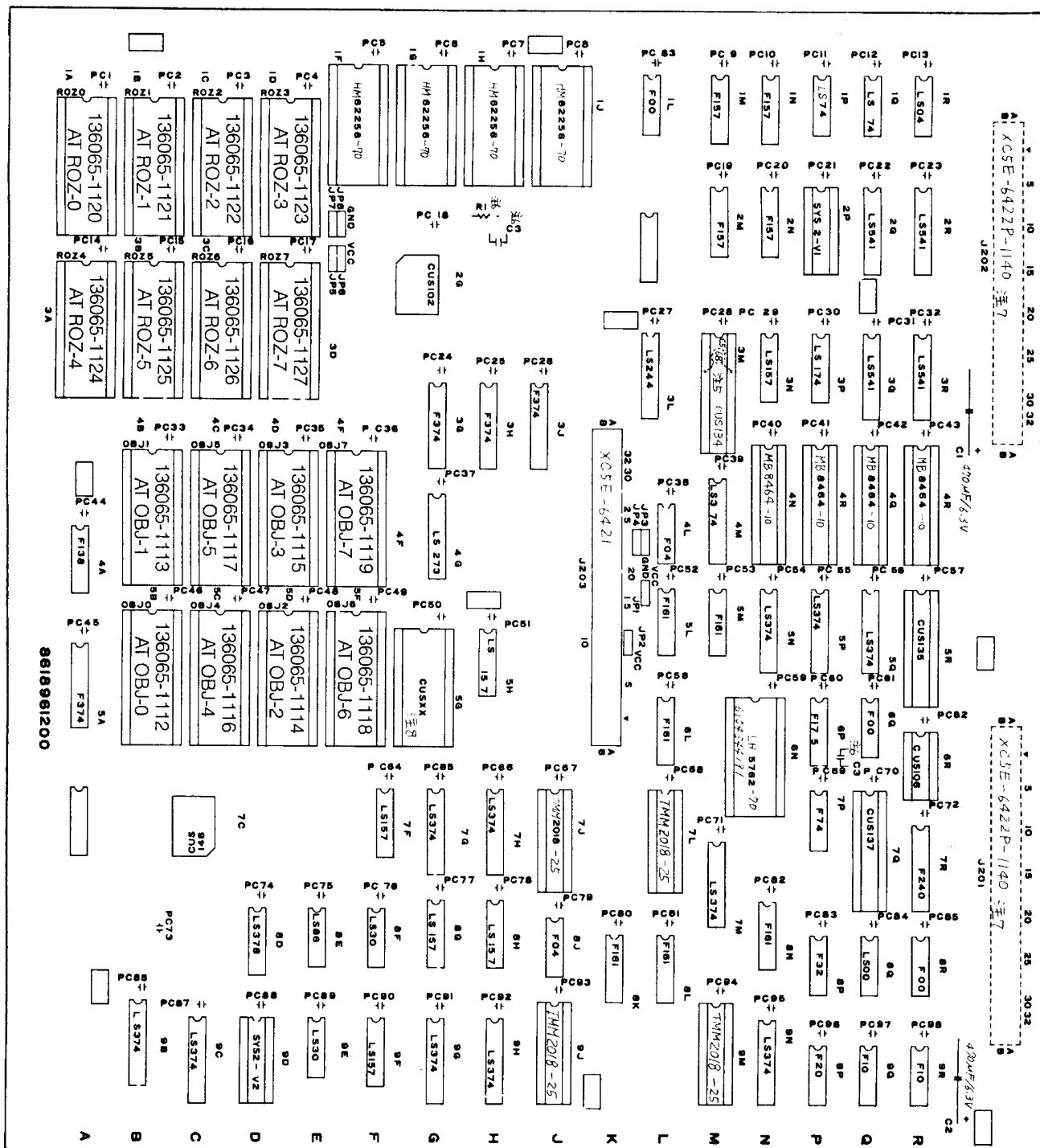
Assault Video PCB Assembly
Parts List

Part No.	Description	Part No.	Description
Capacitors		99-090126	Integrated Circuit, 74LS273
99-090413	Capacitor	99-090128	Integrated Circuit, 74LS374
99-090459	Capacitor, 220PF,12V	99-090131	Integrated Circuit, 74LS378
99-090460	Capacitor, 470μF, 6.3V	99-090428	Integrated Circuit, 74LS541
Integrated Circuits		99-090429	Integrated Circuit, 74F00
136065-1112	Integrated Circuit, EPROM, AT OBJ-0, 5B	99-090288	Integrated Circuit, 74F04
136065-1113	Integrated Circuit, EPROM, AT OBJ-1, 4B	99-090430	Integrated Circuit, 74F10
136065-1114	Integrated Circuit, EPROM, AT OBJ-2, 5D	99-090113	Integrated Circuit, 74F20
136065-1115	Integrated Circuit, EPROM, AT OBJ-3, 4D		
		99-090431	Integrated Circuit, 74F32
136065-1116	Integrated Circuit, EPROM, AT OBJ-4, 5C	99-090432	Integrated Circuit, 74F74
136065-1117	Integrated Circuit, EPROM, AT OBJ-5, 4C	99-090313	Integrated Circuit, 74F138
136065-1118	Integrated Circuit, EPROM, AT OBJ-6, 5F	99-090454	Integrated Circuit, 74F157
136065-1119	Integrated Circuit, EPROM, AT OBJ-7, 4F		
		99-090433	Integrated Circuit, 74F161
136065-1120	Integrated Circuit, ROM, AT ROZ-0, 1A	99-090434	Integrated Circuit, 74F175
136065-1121	Integrated Circuit, ROM, AT ROZ-1, 1B	99-090435	Integrated Circuit, 74F240
136065-1122	Integrated Circuit, ROM, AT ROZ-2, 1C	99-090315	Integrated Circuit, 74F374
136065-1123	Integrated Circuit, ROM, AT ROZ-3, 1D		
		99-090436	Integrated Circuit, RAM, TMM2018AP-25
136065-1124	Integrated Circuit, ROM, AT ROZ-4, 3A	99-090438	Integrated Circuit, RAM, MB8464-10-SK
136065-1125	Integrated Circuit, ROM, AT ROZ-5, 3B	99-090296	Integrated Circuit, M5M5256AP-70 (70NS)
136065-1126	Integrated Circuit, ROM, AT ROZ-6, 3C	99-090455	Integrated Circuit, Custom 102
136065-1127	Integrated Circuit, ROM, AT ROZ-7, 3D	99-090441	Integrated Circuit, Custom 106
99-090108	Integrated Circuit, 74LS00	99-090443	Integrated Circuit, Custom 134
99-090110	Integrated Circuit, 74LS04	99-090444	Integrated Circuit, Custom 135
99-090425	Integrated Circuit, 74LS30	99-090384	Integrated Circuit, Custom 137
99-090115	Integrated Circuit, 74LS74	99-090445	Integrated Circuit, Custom 146
99-090426	Integrated Circuit, 74LS86	99-090456	Integrated Circuit, MOS
99-090120	Integrated Circuit, 74LS157	99-090457	Integrated Circuit, PAL
99-090123	Integrated Circuit, 74LS174	99-090458	Integrated Circuit, PAL
99-090244	Integrated Circuit, 74LS244		
		Resistor	
		99-090191	Resistor, 470 Ohm, ±5%, 1/4W
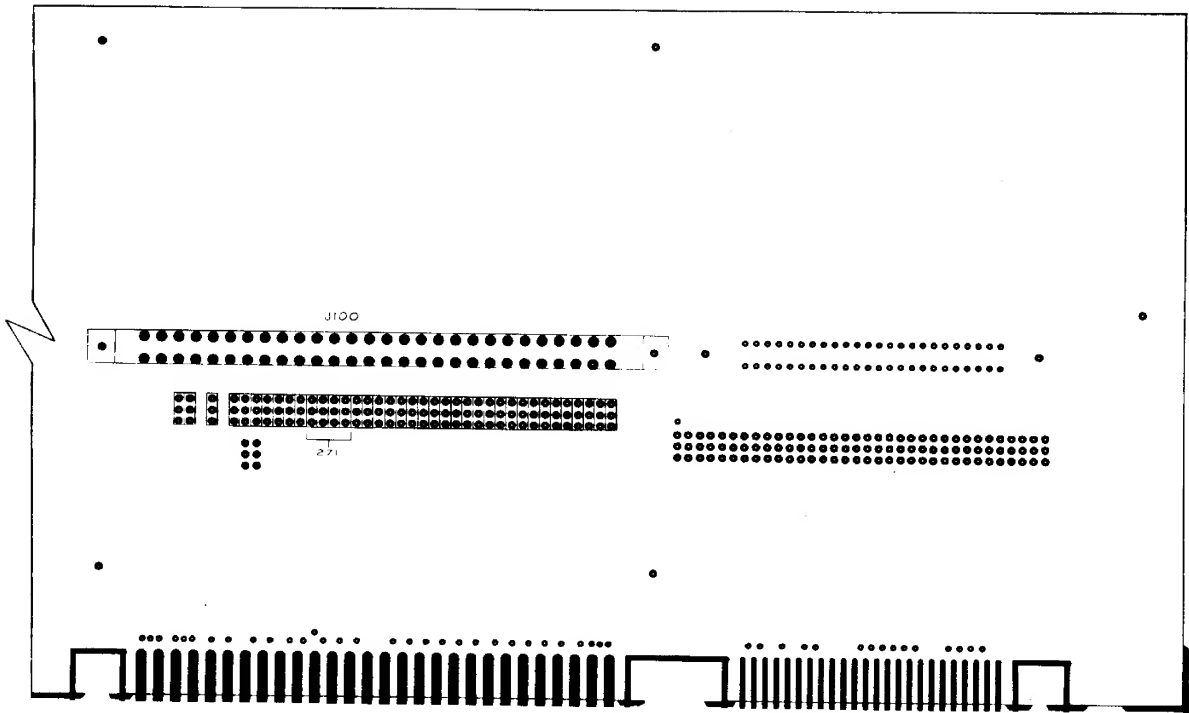
Figure 4-8 Assault End Board Assembly
A044991-02

Assault End Board Assembly
Parts List

Part No.	Description
140006-271	Capacitor, Filter, 270 pf, 50V, 6A
140006-222	Capacitor, Filter, 2200 pf, 50V, 6A
179174-056	Connector, Edge, 56 Ckt, .156 x .200
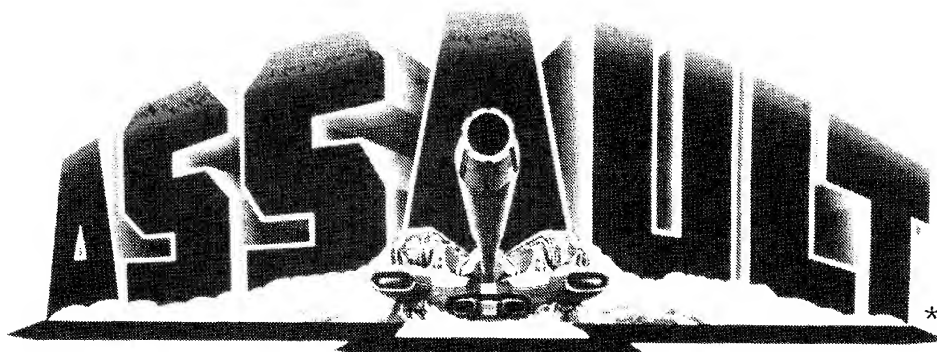
Schematics and Wiring Diagrams

This chapter contains the schematics and wiring diagrams for your game. These are arranged in the following order:

**Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 1)**

044402-xx A

J102
DIN64P

VCC

B32	
A32	
B31	
A31	
B30	
A30	
B29	
A29	
B28	
A28	
B27	
A27	
B26	
A26	
B25	
A25	
B24	
A24	
B23	
A23	
B22	
A22	
B21	
A21	
B20	
A20	
B19	
A19	
B18	
A18	
B17	
A17	
B16	
A16	
B15	
A15	
B14	
A14	
B13	
A13	
B12	
A12	
B11	
A11	
B10	
A10	
B9	
A9	
B8	
A8	
B7	
A7	
B6	
A6	
B5	
A5	
B4	
A4	
B3	
A3	
B2	
A2	
B1	
A1	

!SUBRES 》

EXIRQ 》

!BR1 》

!BUSACK 》

!ACK2 》

!ACK1 》

!BBSY 》

BRIW 》
!BUDS 》
!BLDS 》

A(1:23) 》

D(0:15) 》

GND

SYSTEM BUS

J101
DIN64P

VIDEO & CLOCK BUS

Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 2)

99-090-162

Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 3)

99-090462

VCC RA22
2.2k RM4E

!SUBRES
SYSCLK
IVBLANK

IBRQ
IBUSACK
SCIRQ
POSIRQ
EXIRQ
MCPUIRQ

VCC 51 MODE   /ORES 54
     55 /IRES   /HALT 53
     56 CLK   /VPA 52
     43 /VBNK   /IPL2 59
     50 /WDCIN /IPL1 60
GND 30 /BBSY   /IPL0 61
     32 /BRIN   /DTACK 8
     33 /BACK
     44 IRQ4   /SRES 41
     45 IRQ3   /BRO 31
     46 IRQ2   OIRQ 48
     47 IRQ1   /BEN 29
     34 PI2   PO2   37
     35 PI1   PO1   38
     36 PI0   PO0   39

>> ISYSRES

JP13

21 /VPA   E   20
          BG   11
18 /DTACK VMA 19

23 /IPL2 FC2 26   62 FC2   /M0 21
24 /IPL1 FC1 27   63 FC1   /M1 22
25 /IPL0 FC0 28   64 FC0   /M2 23   LS04   LS04
                                 /MOE 28 3   4   2
                                 /UWE 24   13L
                                 /LWE 27

          /AS   6   4 /AS
          R/W   9   7 R/W
          /UDS 7   5 /UDS
          /LDS 8   6 /LDS   13J

                                        C148

13 /BR   A23 52   9 A23
12 /BGACK A22 51   11 A22
22 /BERR A21 50   12 A21
          A20 49   13 A20
          A19 47   14 A19
          A18 46   15 A18
          A17 45   16 A17   2 A16
15 CK   A16 44   17 A16   3 A15
          A15 43   18 A15   29 A14
          A14 42   19 A14   28 A13
          A13 41   20 A13   4 A12
          A12 40   25 A11
          A11 39   23 A10
          A10 38   26 A9
          A9   37   27 A8
          A8   36   5 A7
          A7   35   6 A6
          A6   34   7 A5
          A5   33   8 A4
          A4   32   9 A3
          A3   31   10 A2
          A2   30   11 A1
          A1   29   12 A0

                                    22   24
                                    CE   OE

9J   VCC-26,58   VCC 31 /PGM   27101
                         GND-18,25   1 VPP   NC 30
MC68000   42,57
          D15 54   21 D7
          D14 55   20 D6
          D13 56   19 D5
          D12 57   18 D4
          D11 58   17 D3
          D10 59   15 D2
          D9   60   14 D1
          D8   61   13 D0

          D7   62   11K   SPR0
          D6   63
          D5   64
17 /HALT D4   1
          D3   2
18 /RESET D2   3   1 D2
          D1   4   2 D1
          D0   5   3 D0

**Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 4)**

99-090462

!RОМ1 ≫

!ROM0 ≫

VCC ⚠
● JP15
⌐ 1M ⚠
⌐⊿ 4M ⚠

22   24

CE   OE

31 A18
30 A17
2 A16
3 A15
29 A14
28 A13
4 A12
25 A11
23 A10
26 A9
27 A8
5 A7
6 A6
7 A5
8 A4
9 A3
10 A2
11 A1
12 A0

19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1

A(1:23) ≫

23C401
NC 1 VCC
13S

21 D7
20 D6
19 D5
18 D4
17 D3
15 D2
14 D1
13 D0

16
14
13
12
11
10
9
8

DATA0

7
6
5
4
3
2
1
0

D(0:15) ≫

Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 5)

99-090462

VCC

OSC 49.152MHz

VCC
OUT
GND

GND
///

8 48M   24M 6
10 16M   12M 4
               6M 22
13 MODE1   16M 5
9 MODE0   10M 3
               8M 2

GND
///

11 /HRES   S1H 23
12 /VRES   S2H 24
              1H 20
              2H 19
              4H 18
              1V 25

12U   2V 26
C137   4V 27
              8V 28
         /HBLNK 17
         /VBLNK 16
         /HSYNC 1
         /VSYNC 14
          CSYNC 15

VCC - 21
GND - 7

Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 6)

99-090462

!AS

!BLDS

BR!W

6C

6C

!BBSY

3   4   5   6

LS04   LS04

23
22
21
20
19
18
17

!WAIT1

A(1:23)

!WAIT2

4   10
2 D PR Q 5   12 D PR Q 9

3 CK 6D   11 CK 6D

LS74   LS74

6   8
CLR /Q   CLR /Q
1   13

SYSCLK

!SCRACK
!PALACK

!SCIACK
!ACK1
!ACK2

MOP0
!SUBRES

Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 7)

99-090462

!DPCS >>————————————————————————————————————

!DPWE >>————————————————————————————————————
!DPOE >>————————————————————————————————————
A(1:23)>>————————————————————————————————————

D(0:15)>>————————————————————————————————————

!CRAM >>————————————————————————————————————
!CWE >>————————————————————————————————————
!COE >>————————————————————————————————————

SA(0:10) >>————————————————————————————————————

IOA(0:10)>>————————————————————————————————————

!CKD >>————————————————————————————————————

RD(0:7) >>————————————————————————————————————

Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 8)

99-090462

!SYSRES 56 /RESET
!SCOM 54 /CS /DTACK 59
!SCOMDT 60 /LTCH /IRQ 57
BR!W 55 R/W

SOUT 41
16M 43 16M SIN 44
12M 11 12M

VCC

8B
C139 GND 20 26
/// CS1 CS2

61 A13
62 A12 RA12 28 9 A12
63 A11 RA11 29 8 A11
64 A10 RA10 30 7 A10
1 A9 RA9 31 6 A9
2 A8 RA8 32 5 A8
3 A7 RA7 33 4 A7
4 A6 RA6 34 3 A6
5 A5 RA5 35 2 A5
6 A4 RA4 36 1 A4
7 A3 RA3 37 21 A3
8 A2 RA2 38 25 A2
9 A1 RA1 39 24 A1
RA0 40 23 A0

A(1:23)

8A

12 D12
13 D11 ROE 25 22 /OE
14 D10 RWE 27 27 /WE
15 D9 M5M5179P
16 D8 RD8 45 19 D8
17 D7 RD7 46 18 D7
18 D6 RD6 47 17 D6
19 D5 RD5 48 16 D5
20 D4 RD4 49 15 D4
21 D3 RD3 50 13 D3
22 D2 RD2 51 12 D2
23 D1 RD1 52 11 D1
24 D0 RD0 53 10 D0

D(0:15)

VCC· 26,58
GND· 10,42

Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 9)

99-090462

8K

17 2A4 2Y4 3
15 2A3 2Y3 5
13 2A2 2Y2 7
11 2A1 2Y1 9
2 1A4 1Y4 8
4 1A3 1Y3 16
6 1A2 1Y2 14
8 1A1 1Y1 12
1 1G /2G 19
F244

12M ≫

!VBLANK ≫
!HBLANK ≫
!VSYNC ≫
!HSYNC ≫

!SCRDT ≫

!SCR ≫

BRIW ≫

53 CK LTC 51
FLIP 61
54 VBLNK OTEN 50
55 HBLNK /OE 22
56 VSYNC
57 HSYNC

59 /LAT AB14 49
AB13 48
58 /CS AB12 47
AB11 46
60 R/W AB10 45
AB9 44
AB8 43
AB7 41
74 A7 AB6 40
75 A6 AB5 39
76 A5 AB4 38
77 A4 AB3 37
78 A3 AB2 36
79 A2 AB1 35
80 A1 AB0 34
6L
/WE 32
C145
64 D15 DB15 31
65 D14 DB14 30
66 D13 DB13 29
67 D12 DB12 28
68 D11 DB11 27
69 D10 DB10 26
70 D9 DB9 25
71 D8 DB8 24

72 D7 DB7 21
1 D6 DB6 20
3 D5 DB5 19
4 D4 DB4 18
5 D3 DB3 17
6 D2 DB2 16
7 D1 DB1 15
8 D0 DB0 14

LCK 13

LN2 11
LN1 10
LN0 9

/DTACK 62

VCC- 33,73
GND- 2,12,23,
42,52,63

A(1:23) ≫

D(0:15) ≫

9M
20
CS
1 A14
26 A13
2 A12
23 A11
21 A10
24 A9
25 A8
3 A7
4 A6
5 A5
6 A4
7 A3
8 A2
9 A1
10 A0
62256
27 /WE
22 /OE
19 D7
18 D6
17 D5
16 D4
15 D3
13 D2
12 D1
11 D0

9K
20
CS
1 A14
26 A13
2 A12
23 A11
21 A10
24 A9
25 A8
3 A7
4 A6
5 A5
6 A4
7 A3
8 A2
9 A1
10 A0
62256
27 /WE
22 /OE
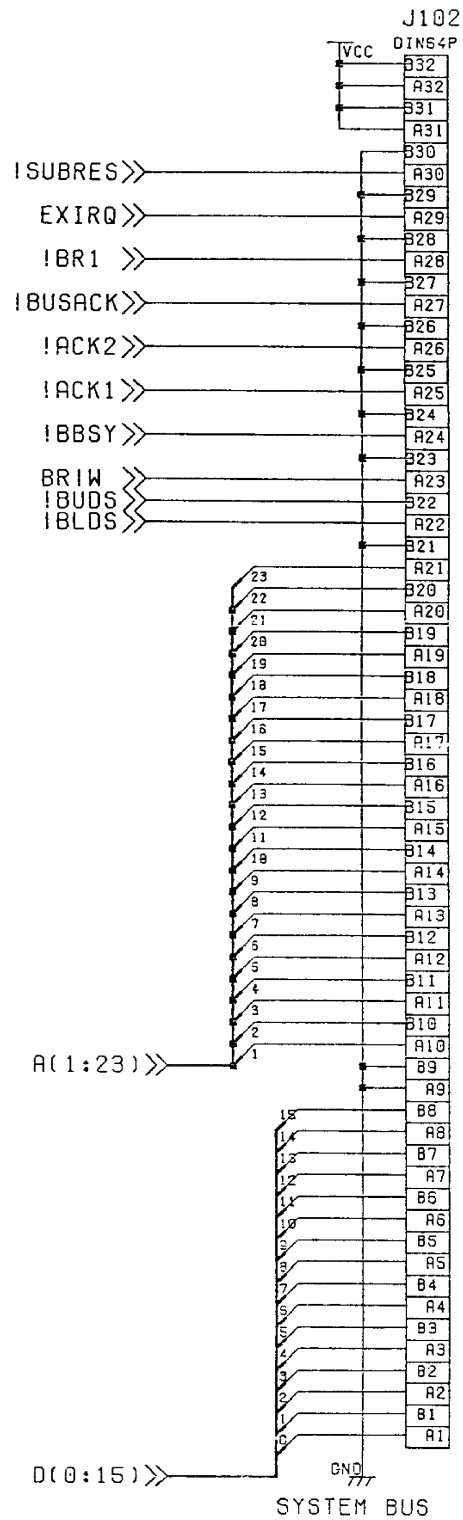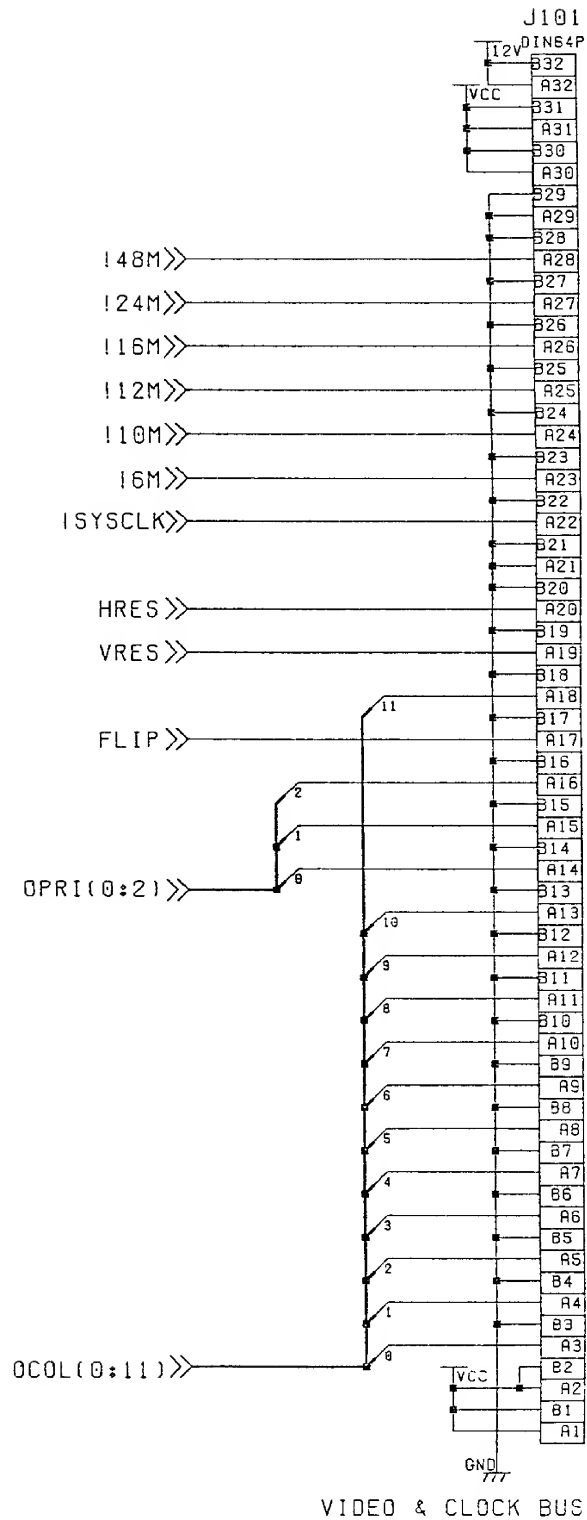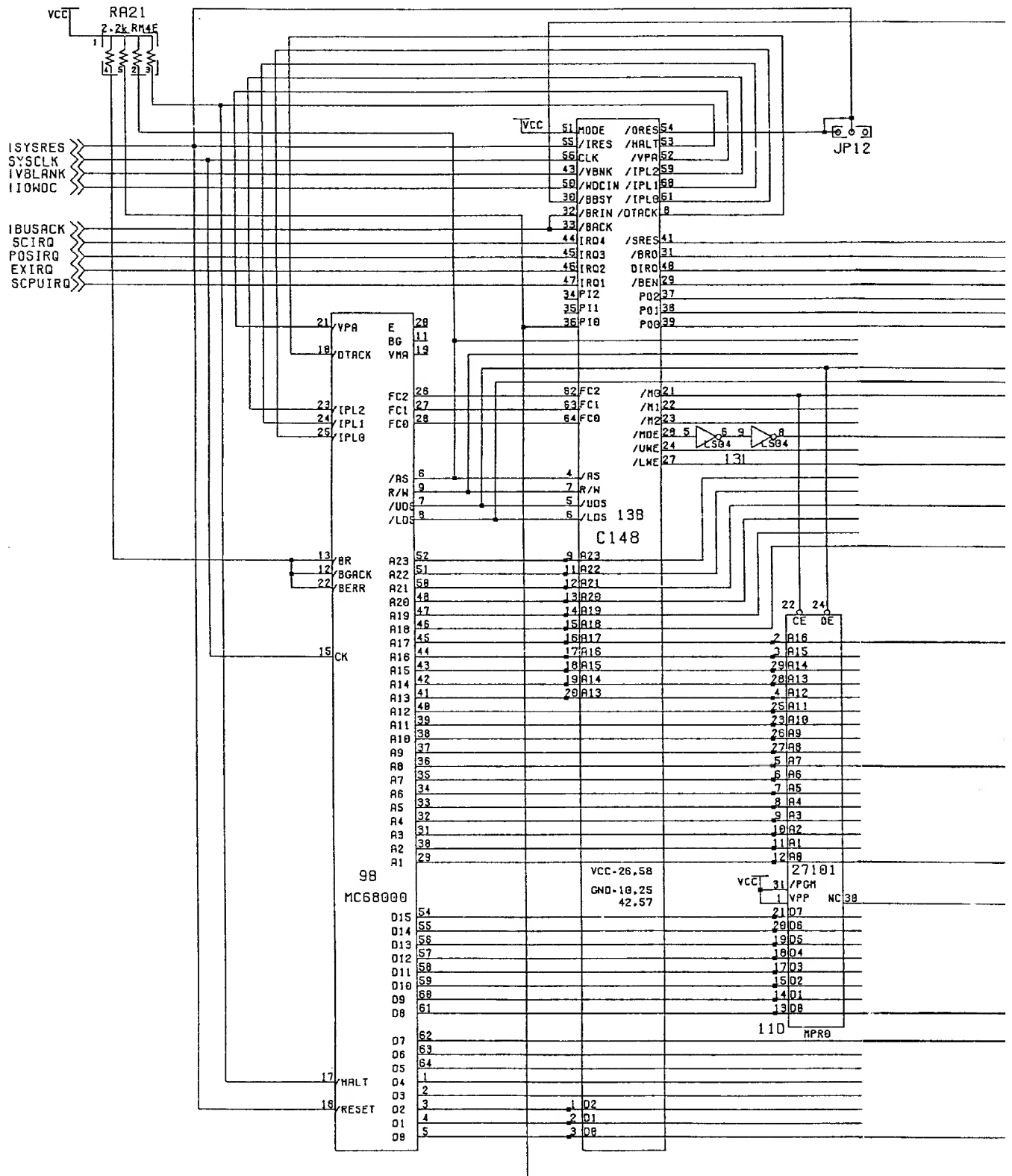19 D7
18 D6
17 D5
16 D4
15 D3
13 D2
12 D1
11 D0

GND

≫ !SCRACK

Figure 5-1
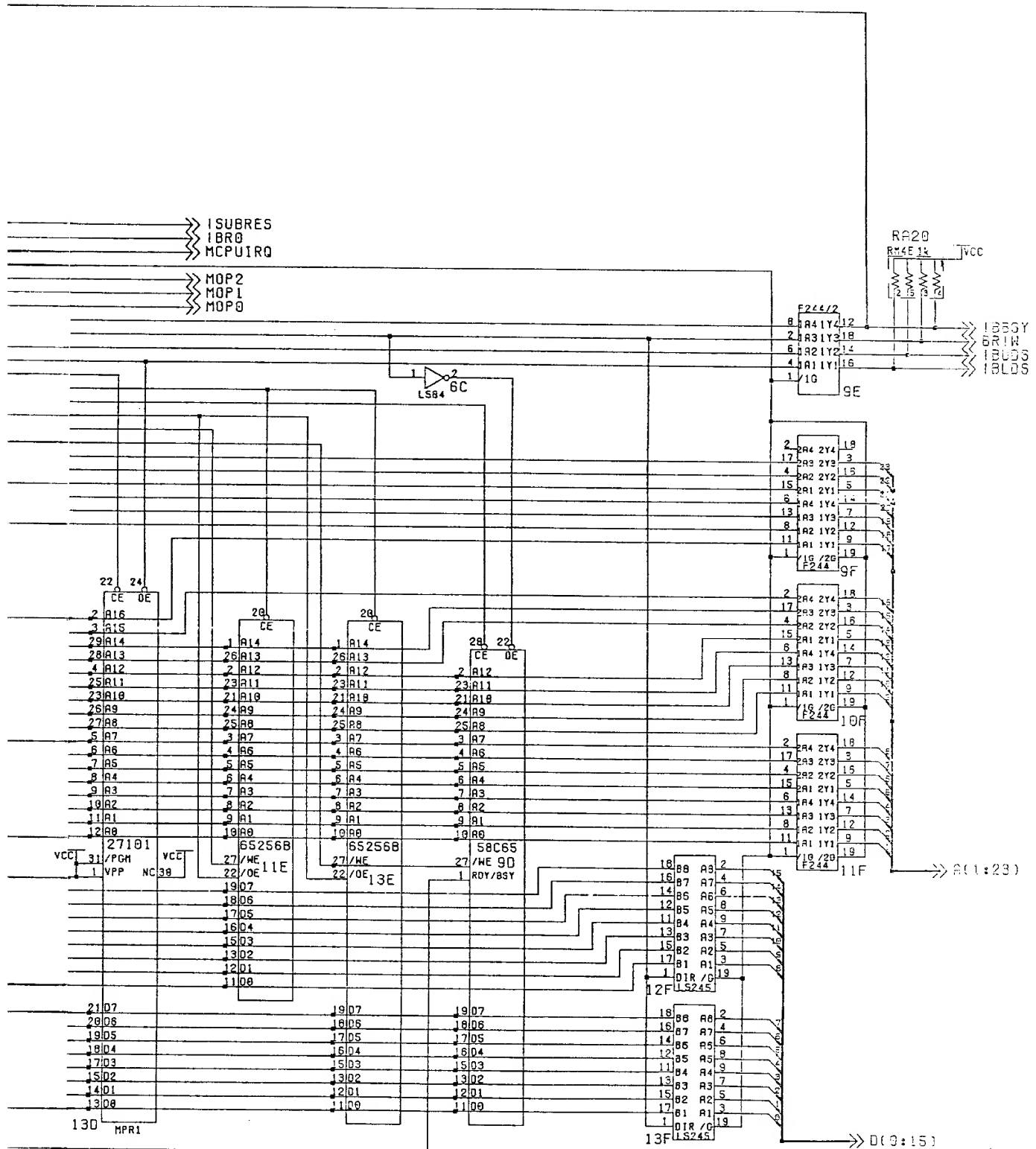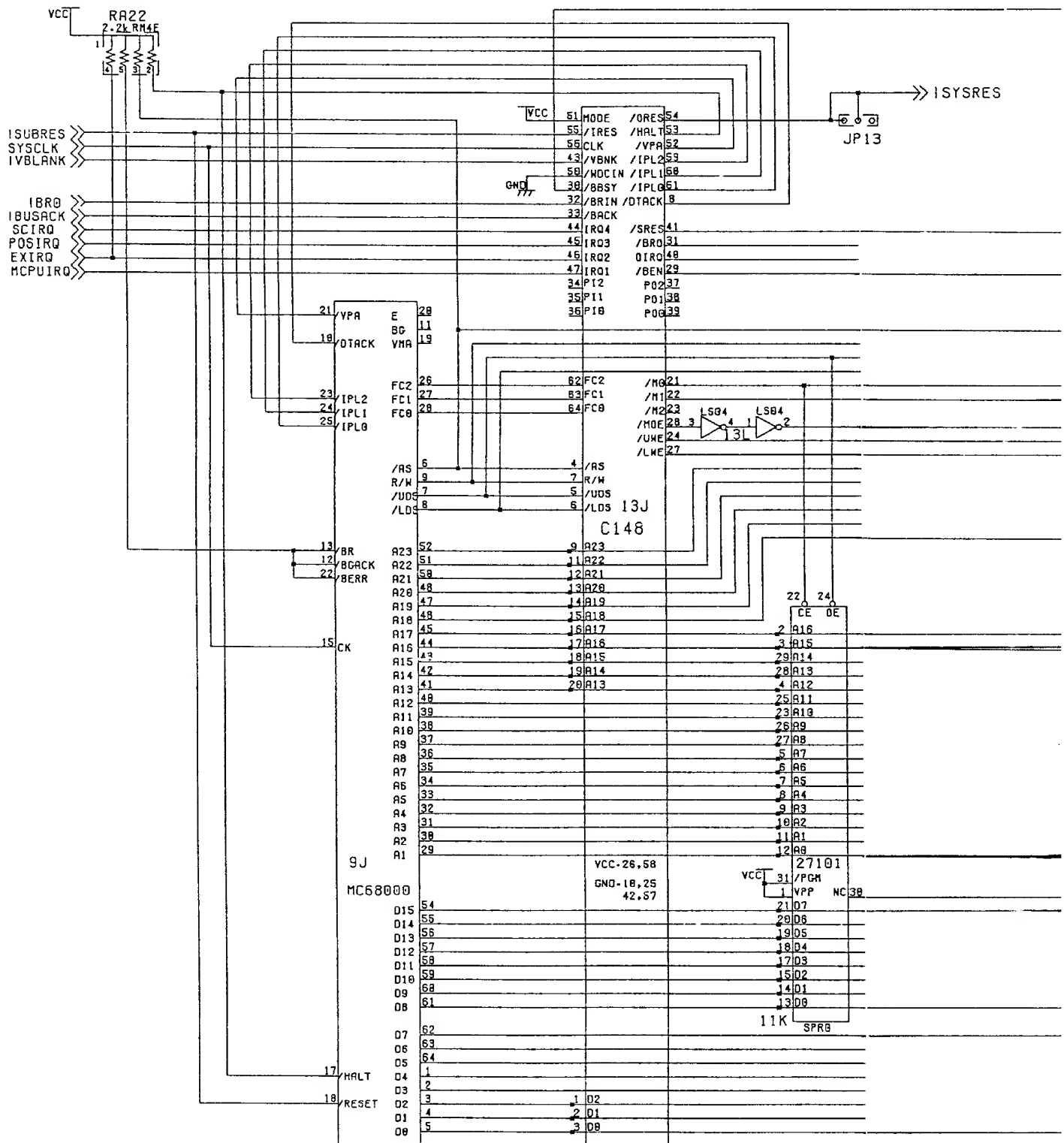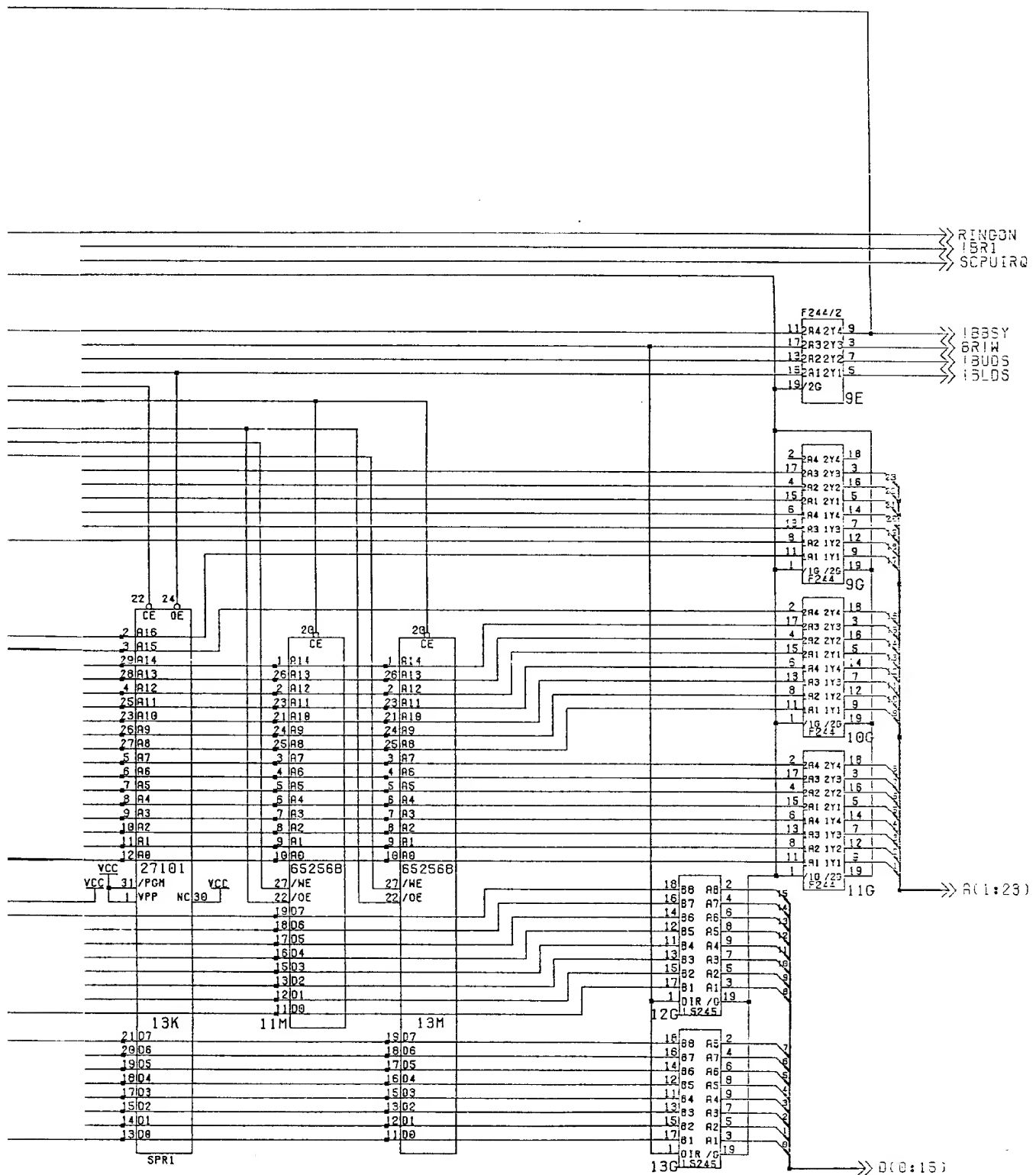**Assault™ CPU PCB Assembly**
Schematic Diagram
(Sheet 10)

99-090462

VCC 6 G1 Y7 7
4 G2A Y6 9
5 G2B Y5 10
GND Y4 11
Y3 12
8T
19 3 C Y2 13
18 2 B Y1 14
17 1 A Y0 15
F138

JP80
E P
101 JP86 GND
16 MASK
301 MASK
GND
VCC JP88
21 22 24 22 24 22 24 22 24
4M CE OE CE OE CE OE CE OE
VCC JP87 1M 31 A18 31 A18 31 A18 31 A18
20 4M 30 A17 30 A17 30 A17 30 A17
15 2 A16 2 A16 2 A16 2 A16
14 3 A15 3 A15 3 A15 3 A15
13 29 A14 29 A14 29 A14 29 A14
12 28 A13 28 A13 28 A13 28 A13
11 4 A12 4 A12 4 A12 4 A12
10 25 A11 25 A11 25 A11 25 A11
9 23 A10 23 A10 23 A10 23 A10
8 26 A9 26 A9 26 A9 26 A9
7 27 A8 27 A8 27 A8 27 A8
6 5 A7 5 A7 5 A7 5 A7
5 6 A6 6 A6 6 A6 6 A6
4 7 A5 7 A5 7 A5 7 A5
3 8 A4 8 A4 8 A4 8 A4
2 9 A3 9 A3 9 A3 9 A3
1 10 A2 10 A2 10 A2 10 A2
0 11 A1 11 A1 11 A1 11 A1
12 A0 12 A0 12 A0 12 A0

11N 11P 11R 11S
NC 1 VCC NC 1 VCC NC 1 VCC NC 1
23C401 23C401 23C401 23C401

CHA(0:21)

21 D7 21 D7 21 D7 21 D7
20 D6 20 D6 20 D6 20 D6
19 D5 19 D5 19 D5 19 D5
18 D4 18 D4 18 D4 18 D4
17 D3 17 D3 17 D3 17 D3
15 D2 15 D2 15 D2 15 D2
14 D1 14 D1 14 D1 14 D1
13 D0 13 D0 13 D0 13 D0

CHR0 CHR1 CHR2 CHR3

22 24 CE OE
31 A18
30 A17
2 A16
3 A15
29 A14
28 A13
4 A12
25 A11
23 A10
26 A9
27 A8
5 A7
6 A6
7 A5
8 A4
9 A3
10 A2
11 A1
12 A0

VCC 9N NC 1
23C401
21 D7
20 D6
19 D5
18 D4
17 D3
15 D2
14 D1
13 D0

CHR4

22 24 CE OE
31 A18
30 A17
2 A16
3 A15
29 A14
28 A13
4 A12
25 A11
23 A10
26 A9
27 A8
5 A7
6 A6
7 A5
8 A4
9 A3
10 A2
11 A1
12 A0

VCC 9P NC 1
23C401
21 D7
20 D6
19 D5
18 D4
17 D3
15 D2
14 D1
13 D0

CHR5

22 24 CE OE
31 A18
30 A17
2 A16
3 A15
29 A14
26 A13
4 A12
25 A11
23 A10
26 A9
27 A8
5 A7
6 A6
7 A5
8 A4
9 A3
10 A2
11 A1
12 A0

VCC 9R NC 1
23C401
21 D7
20 D6
19 D5
18 D4
17 D3
15 D2
14 D1
13 D0

CHR6

22 24 CE OE
31 A18
30 A17
2 A16
3 A15
29 A14
28 A13
4 A12
25 A11
23 A10
26 A9
27 A8
5 A7
6 A6
7 A5
8 A4
9 A3
10 A2
11 A1
12 A0

VCC 9S NC 1
23C401
21 D7
20 D6
19 D5
18 D4
17 D3
15 D2
14 D1
13 D0

CHR7

8S
13 D8 Q 12
14 D7 Q 15
17 D6 Q 16
18 D5 Q 19
3 D4 Q 2
4 D3 Q 5
7 D2 Q 6
8 D1 Q 9
11 CK G
F374
GND

>> SCOL(0:7)

DD6M >>

Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 11)

99-090462

SCOL(0:7)

pin	signal
2	SCOL7
52	SCOL6
64	SCOL5
63	SCOL4
62	SCOL3
61	SCOL2
60	SCOL1
59	SCOL0

SPRI(0:2)

5	SPRI2
4	SPRI1
3	SPRI0

SNM(0:2)

8	SNM2
7	SNM1
6	SNM0

OCOL(0:11)

pin	signal	AB
38	AB12	
9	OCOL11	AB11 31
20	OCOL10	AB10 28
19	OCOL9	AB9 33
18	OCOL8	AB8 35
17	OCOL7	AB7 37
16	OCOL6	AB6 36
15	OCOL5	AB5 34
14	OCOL4	AB4 32
13	OCOL3	AB3 30
12	OCOL2	AB2 29
11	OCOL1	AB1 25
27	OCOL0	AB0 24

OPRI(0:2)

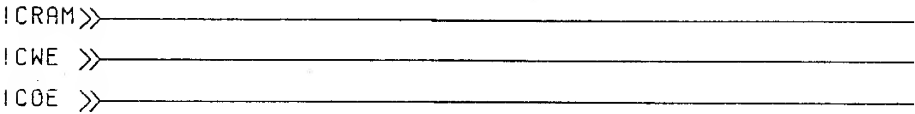| 23 | OPRI2 |
| 22 | OPRI1 |
| 21 | OPRI0 |

C156 5P

55	A14
54	A13
53	A10
51	A9
50	A8
49	A7
48	A6
47	A5
46	A4
45	A3
44	A2
43	A1
40	A0

57 12M
56 HSYNC   CL 41

VCC: 26:58
GND: 10:42

6264 6S
6264 6T
6264 6U

GND 28 26 CS1 CS2 VCC

2	A12
23	A11
21	A10
24	A9
25	A8
3	A7
4	A6
5	A5
6	A4
7	A3
8	A2
9	A1
10	A0
27	/WE
22	/OE
19	D7
18	D6
17	D5
16	D4
15	D3
13	D2
12	D1
11	D0

RDD(0:7)
GRD(0:7)
BLD(0:7)

A(1:23)
BRIW
IPALET
!HSYNC
!VSYNC
D12M

D(0:15)

!CSYNC

POSIRQ
IPALACK

9 RD7   INT 75
8 RD6 DTACK 76
7 RD5
6 RD4
5 RD3
4 RD2
3 RD1
2 RD0   /RWE 10
              /GWE 21
20 GD7   /BWE 30
19 GD6   /OE 11
18 GD5
17 GD4   RD7 49 9 D7   OUT 10
16 GD3   RD6 50 8 D6
15 GD2   RD5 51 7 D5
14 GD1   RD4 52 6 D4   R-2R
13 GD0   RD3 54 5 D3
              RD2 55 4 D2
29 BD7   RD1 56 3 D1
28 BD6   RD0 57 2 D0
27 BD5   GND
26 BD4   1
25 BD3   GND
24 BD2
23 BD1
22 BD0

RA13

58 D7   GD7 41 9 D7   OUT 10
59 D6   GD6 42 8 D6
60 D5   GD5 43 7 D5
61 D4   GD4 44 6 D4   R-2R
62 D3   GD3 45 5 D3
63 D2   GD2 46 4 D2
64 D1   GD1 47 3 D1
65 D0   GD0 48 2 D0
                     GND
C116   1
66 A12 4T   GND
67 A11
77 A3
78 A2
79 A1   BD7 31 9 D7   OUT 10
80 A0   BD6 32 8 D6
         BD5 35 7 D5
69 R/W BD4 36 6 D4   R-2R
68 CS   BD3 37 5 D3
         BD2 38 4 D2
73 HSYNC BD1 39 3 D1
74 VSYNC BD0 40 2 D0
70 12M   GND
1 CL   1
                     GND
VCC- 34,72
GND -12,33,53,71

RA14

RA15

RA17
RM4E 2.7k
[1 2 3 4 5] GND

RA18
RM4E 470
[1 2 3 4 5] GND

VCC
RA19
RM4E 100
[1 2 3 4 5] GND

TR11
A1015
GND

VCC
C2320
TR14

RED

TR10
A1015
GND

VCC
C2320
TR13

GREEN

TR9
A1015
GND

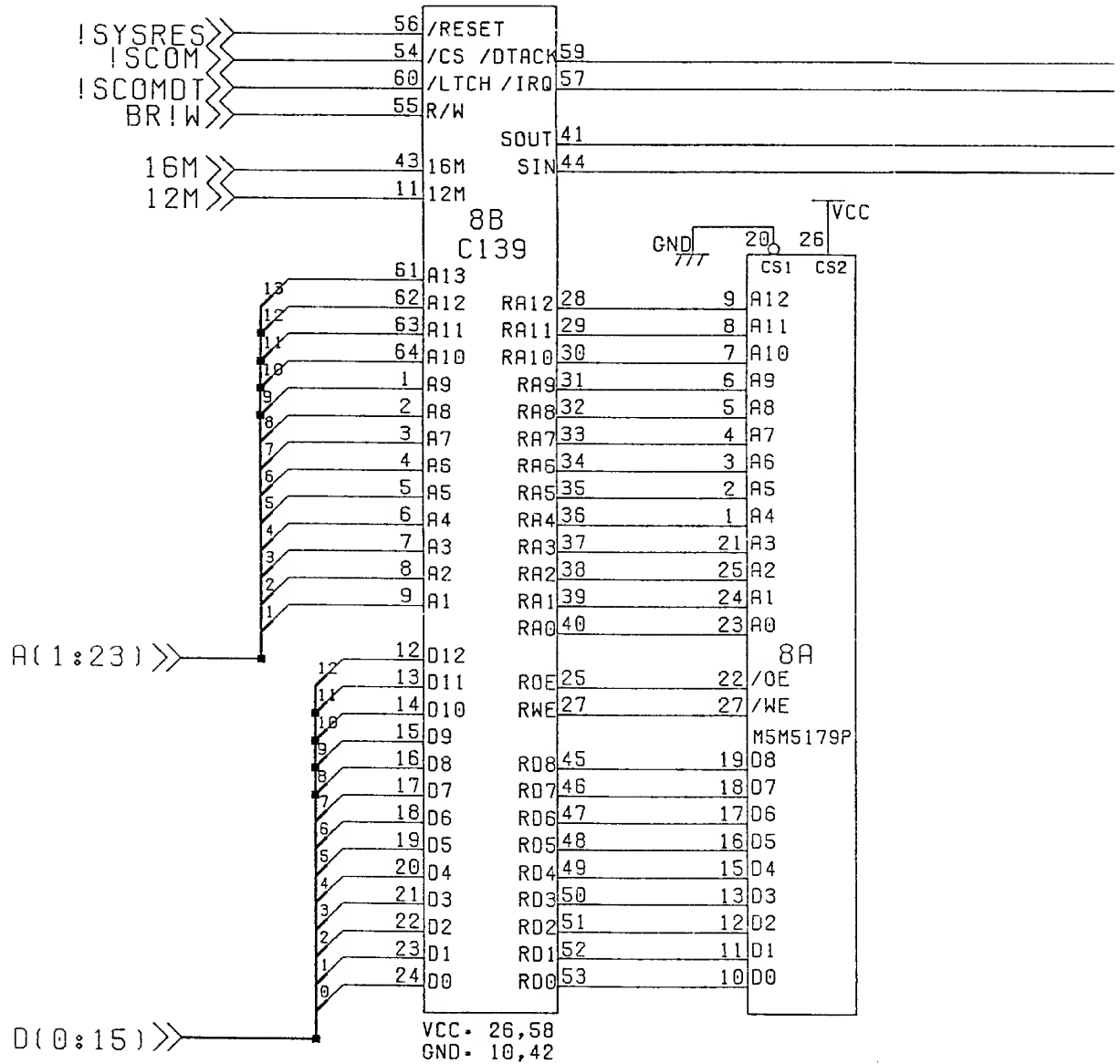VCC
C2320
TR12

BLUE

R55
100
SYNC

Figure 5-1
Assault™ CPU PCB Assembly
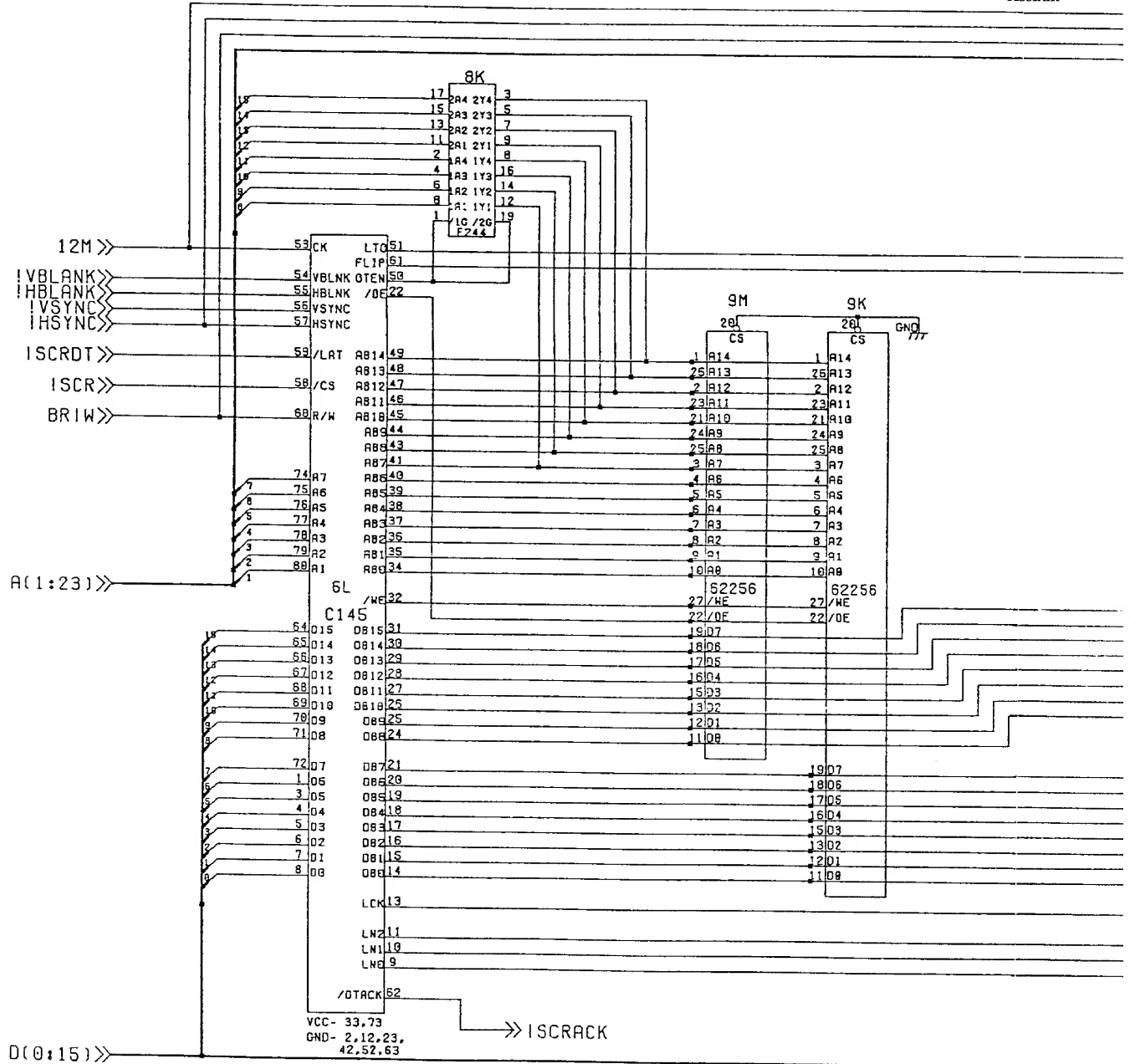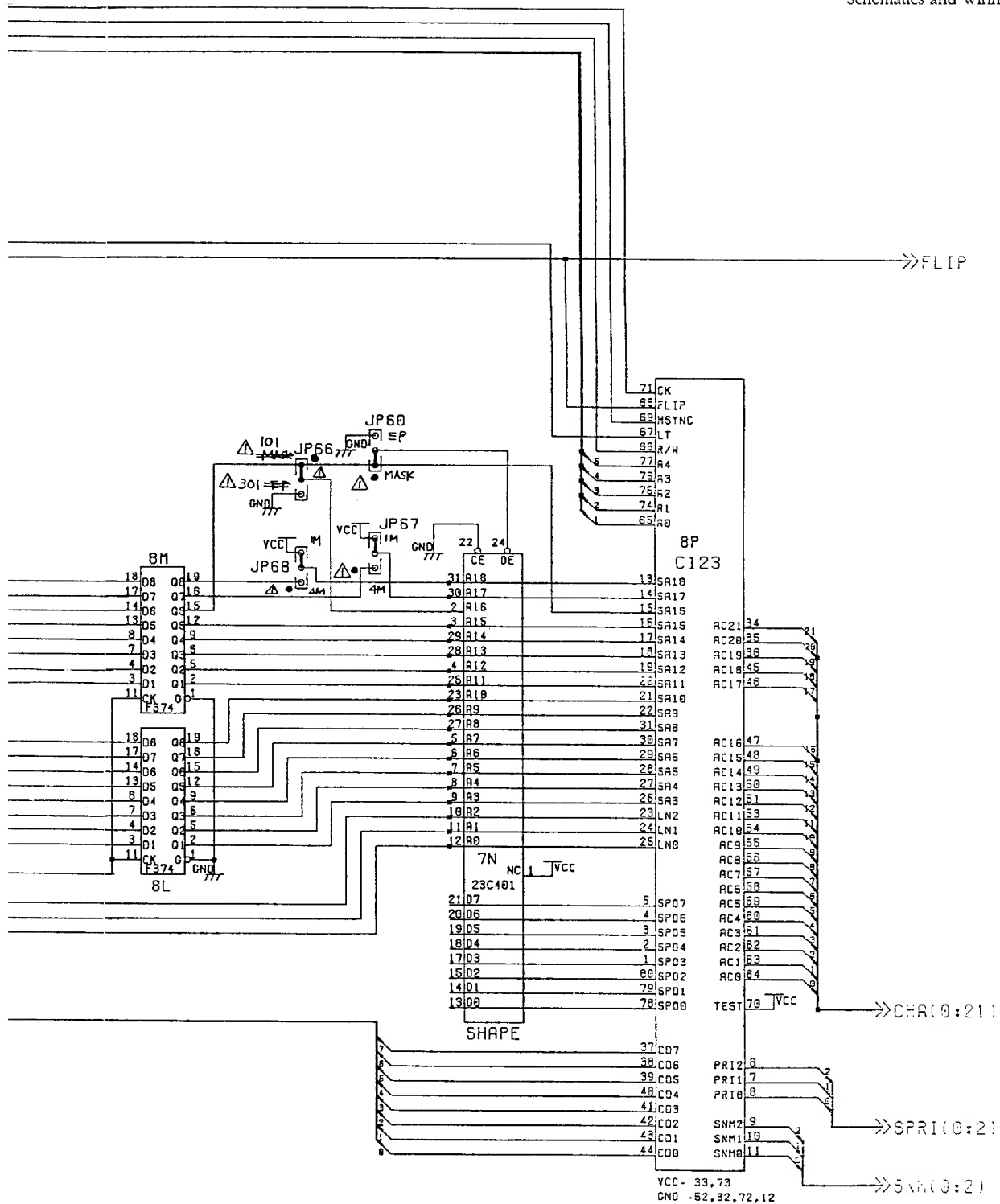**Schematic Diagram**
(Sheet 12)

99-090462

ISYSRES

CKD
ICKD
CKC
ICKC
CKB
ICKB

ICKA

VCC

PR
SE
LS74
CK
CLR /Q

12V
C24
GND

AMPON

5D
7 IN6 O6 10
6 IN5 O5 11
5 IN4 O4 12
4 IN3 O3 13
3 IN2 O2 14
2 IN1 O1 15
1 ST COM 9
LB1760

MUTE

MOP2
MOP1

GOUT(0:4)

1K
R13

TR8
C2236
GND

5C
7 IN6 O6 10
6 IN5 O5 11
5 IN4 O4 12
4 IN3 O3 13
3 IN2 O2 14
2 IN1 O1 15
1 ST COM 9
LB1760

LOCK
COIN1
COIN2
LCG1
LCG2
LCG3

5F
PAL16L8
1 IA OA 12
2 IB OB 13
3 IC OC 14
4 ID OD 15
5 IE OE 16
6 IF OF 17
7 IG OG 18
8 IH OH 19
9 II
11 IJ

IIOWDC
IIORAM
IST
IOIPSW

GND
20 22
CE OE
27 A14
26 A13
2 A12
23 A11
21 A10
24 A9
25 A8
3 A7
4 A6
5 A5
6 A4
7 A3
8 A2
9 A1
10 A0
VCC 1 VPP
27256
3F
19 O7
18 O6
17 O5
16 O4
15 O3
13 O2
12 O1
11 O0
IOPRG

2A
AC240

47
R6

SCOUT

R16
1K
VCC

VCC

R14
100

8
4
5
2
1
GND
PC900
5A

228 R15

SCINA

SCINK

IOA(0:10)

2F
18 B8 A8 2
17 B7 A7 3
16 B6 A6 4
15 B5 A5 5
14 B4 A4 7
13 B3 A3 6
12 B2 A2 8
11 B1 A1 9
1 DIR /C
LS245

RD(0:7)

IORIW

IOD(0:7)

**Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 13)**

Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 14)

99-090462

Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 15)
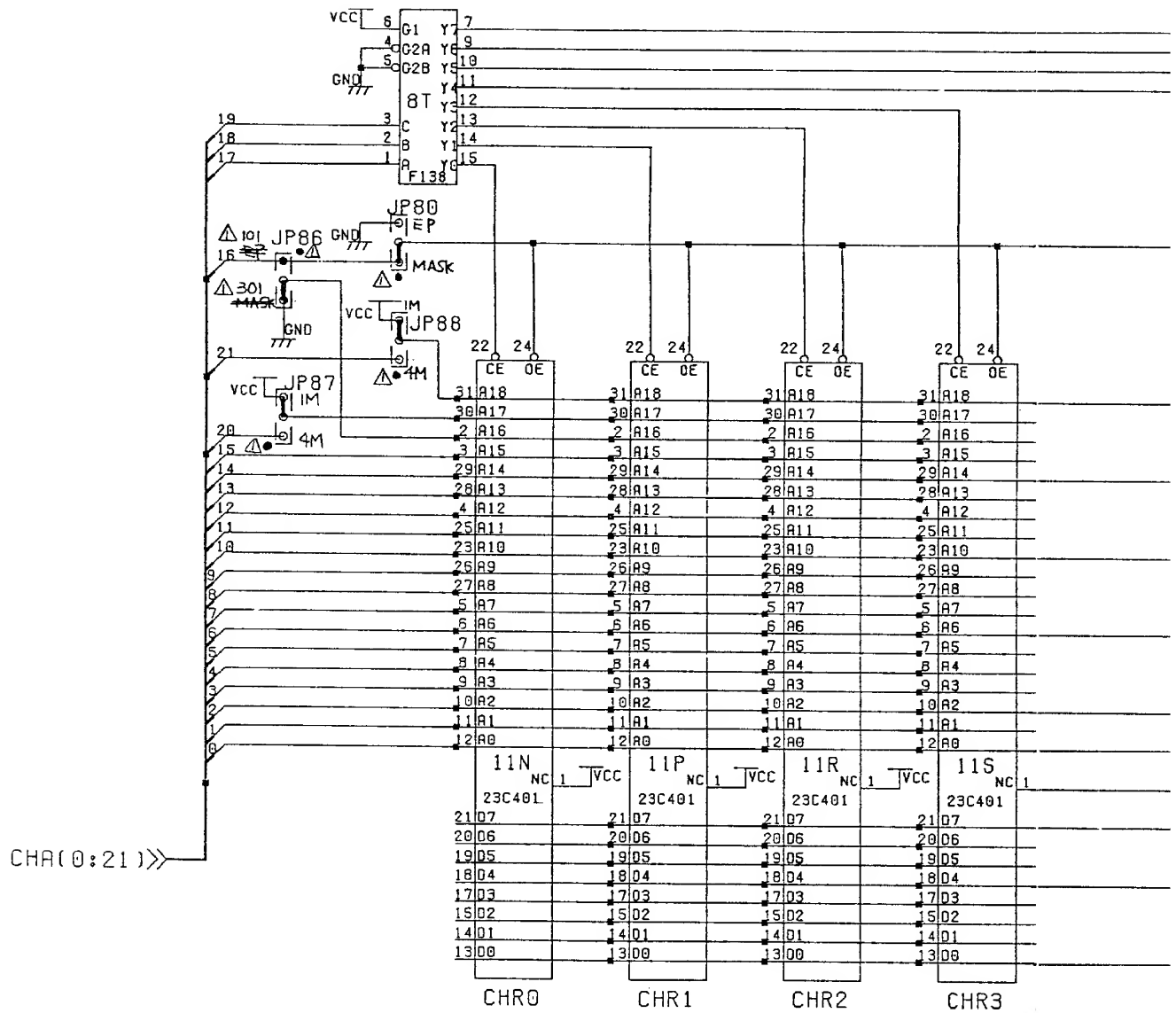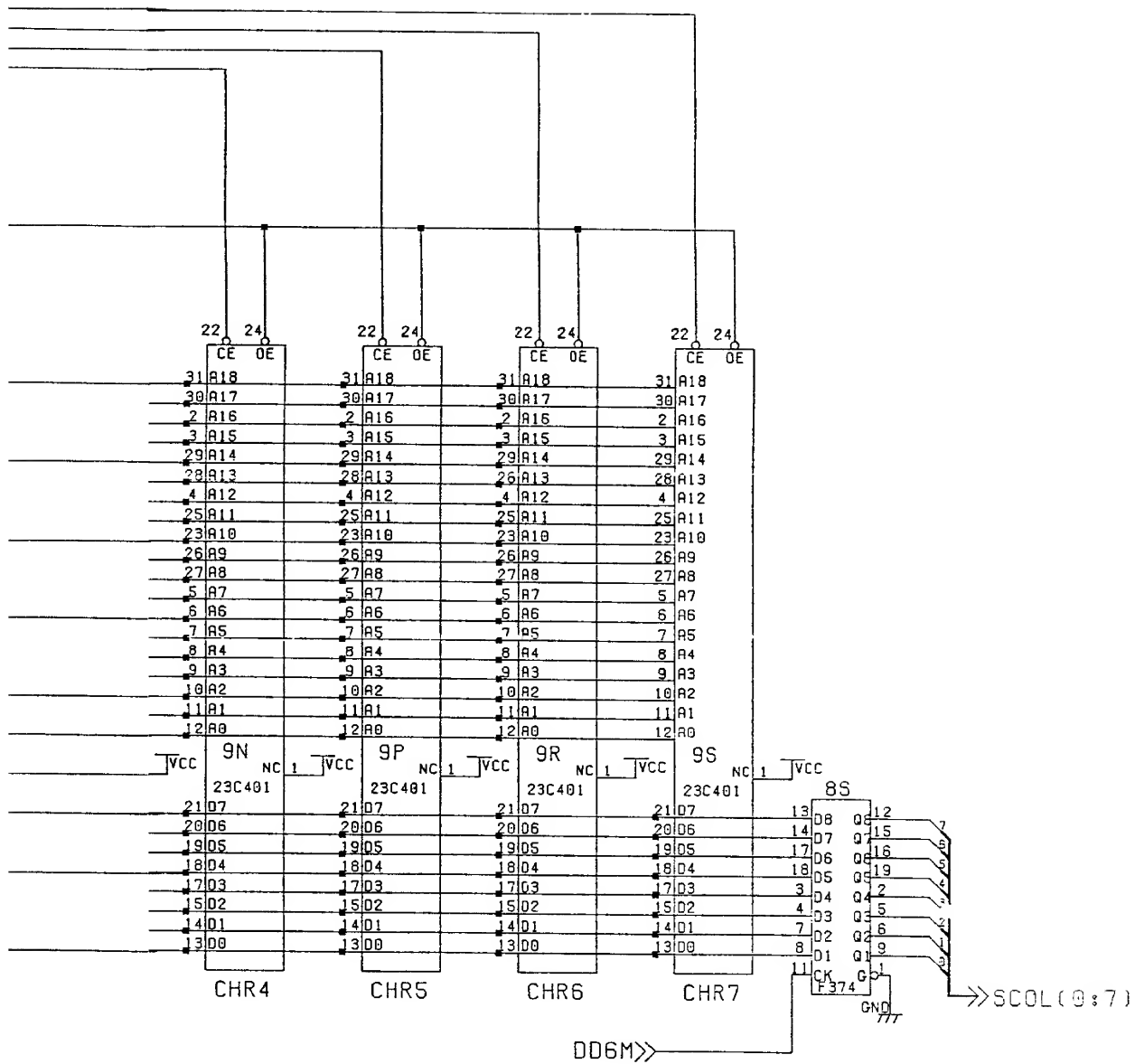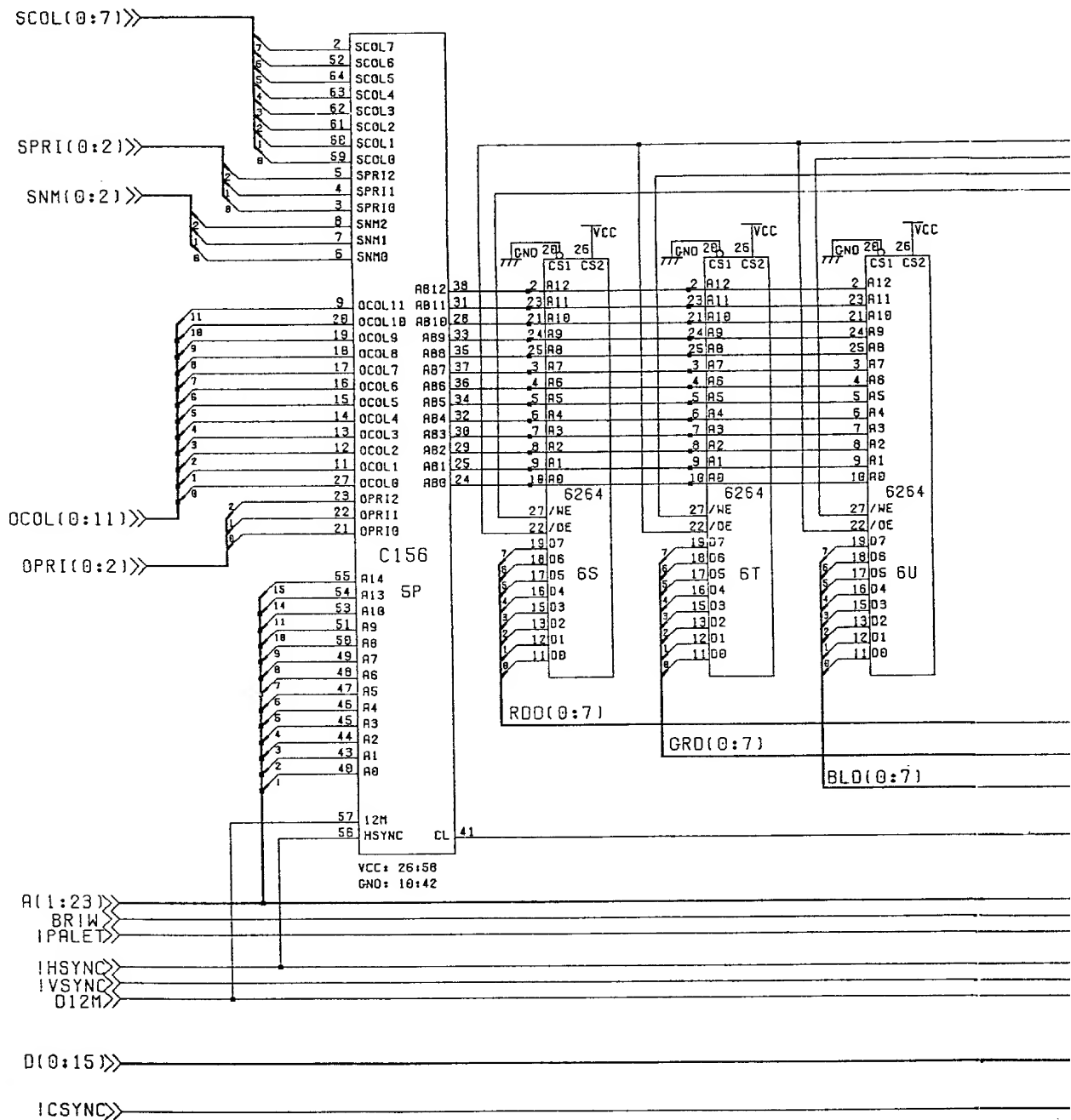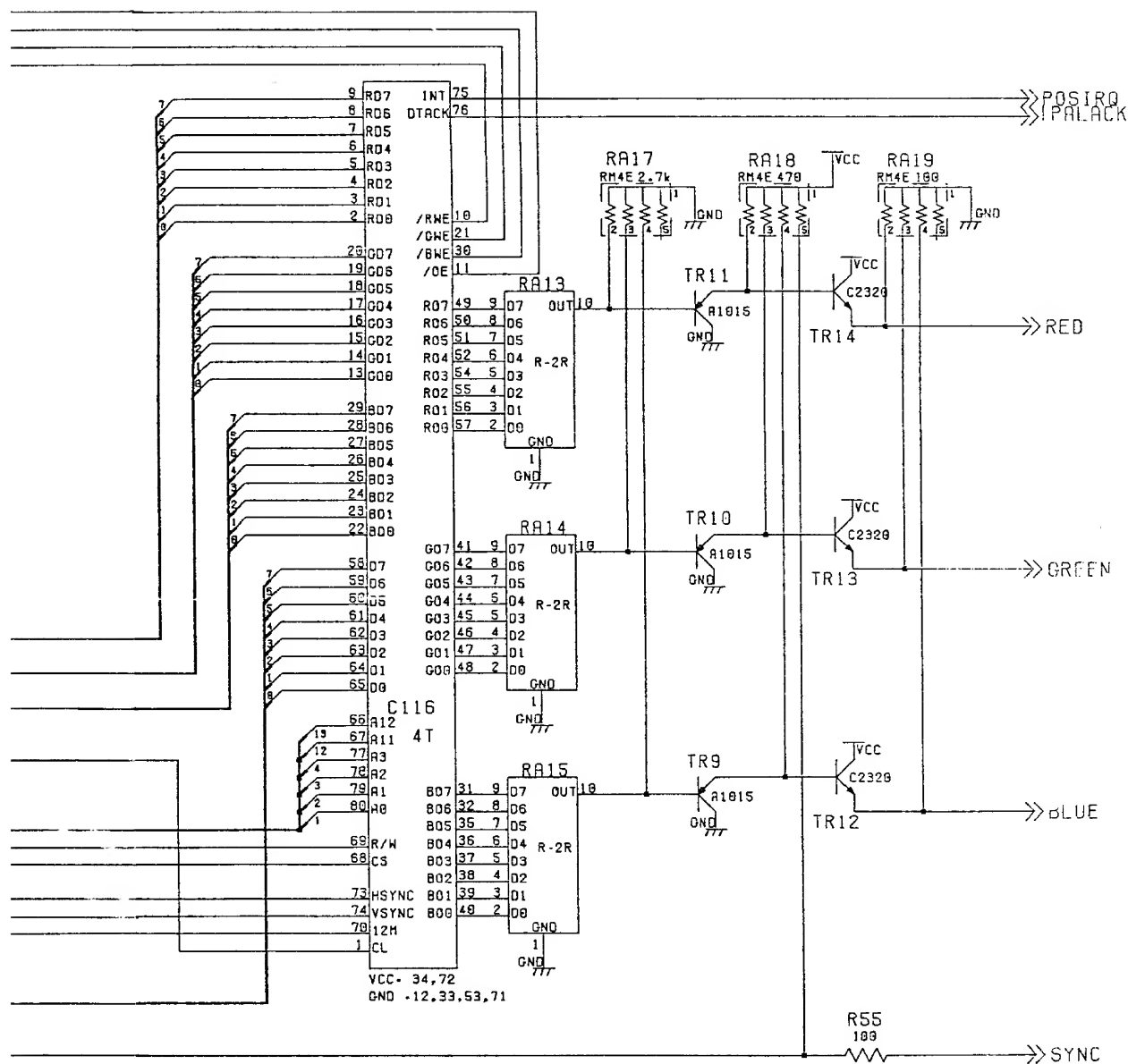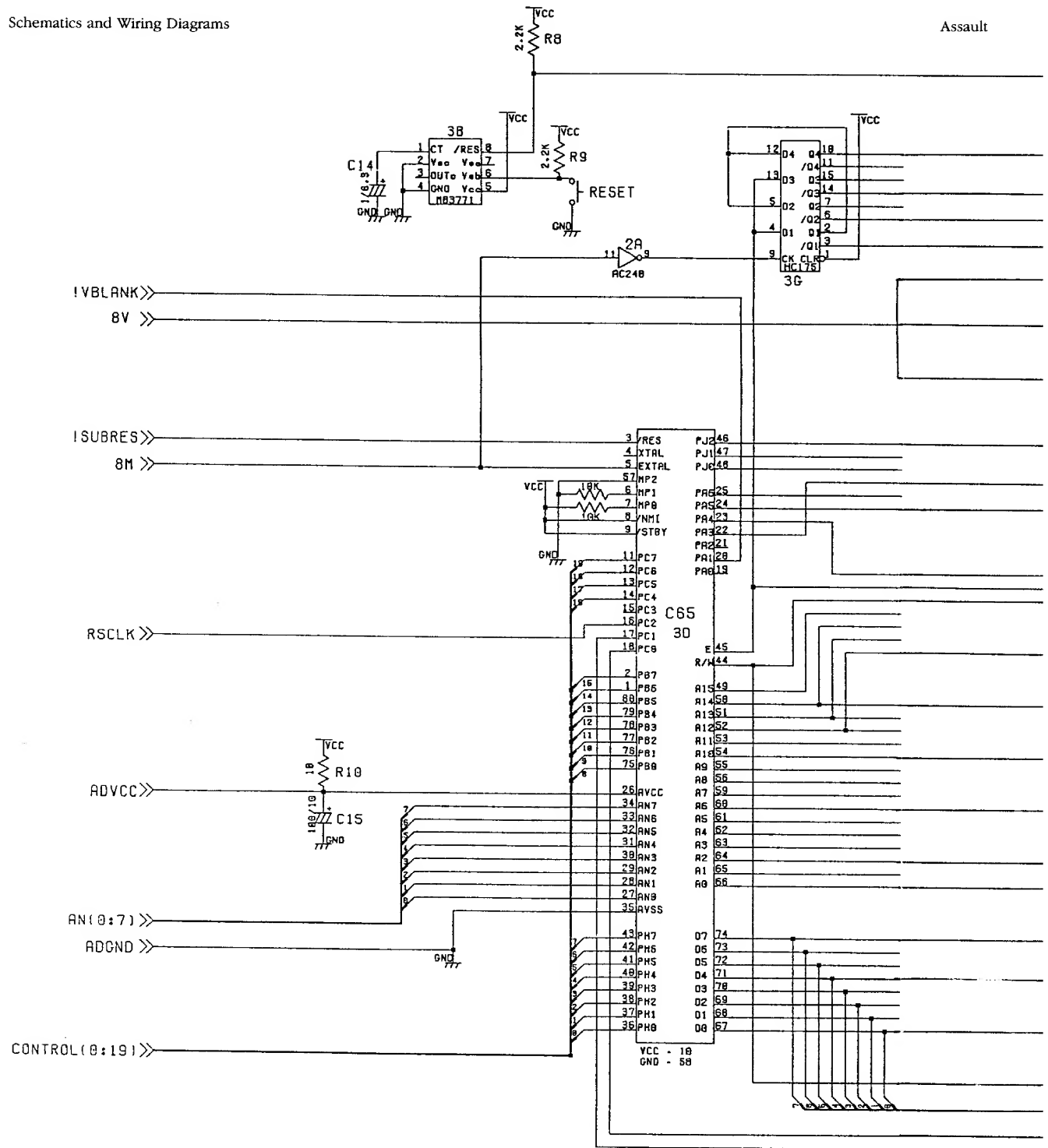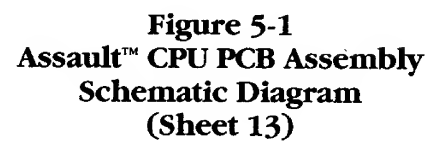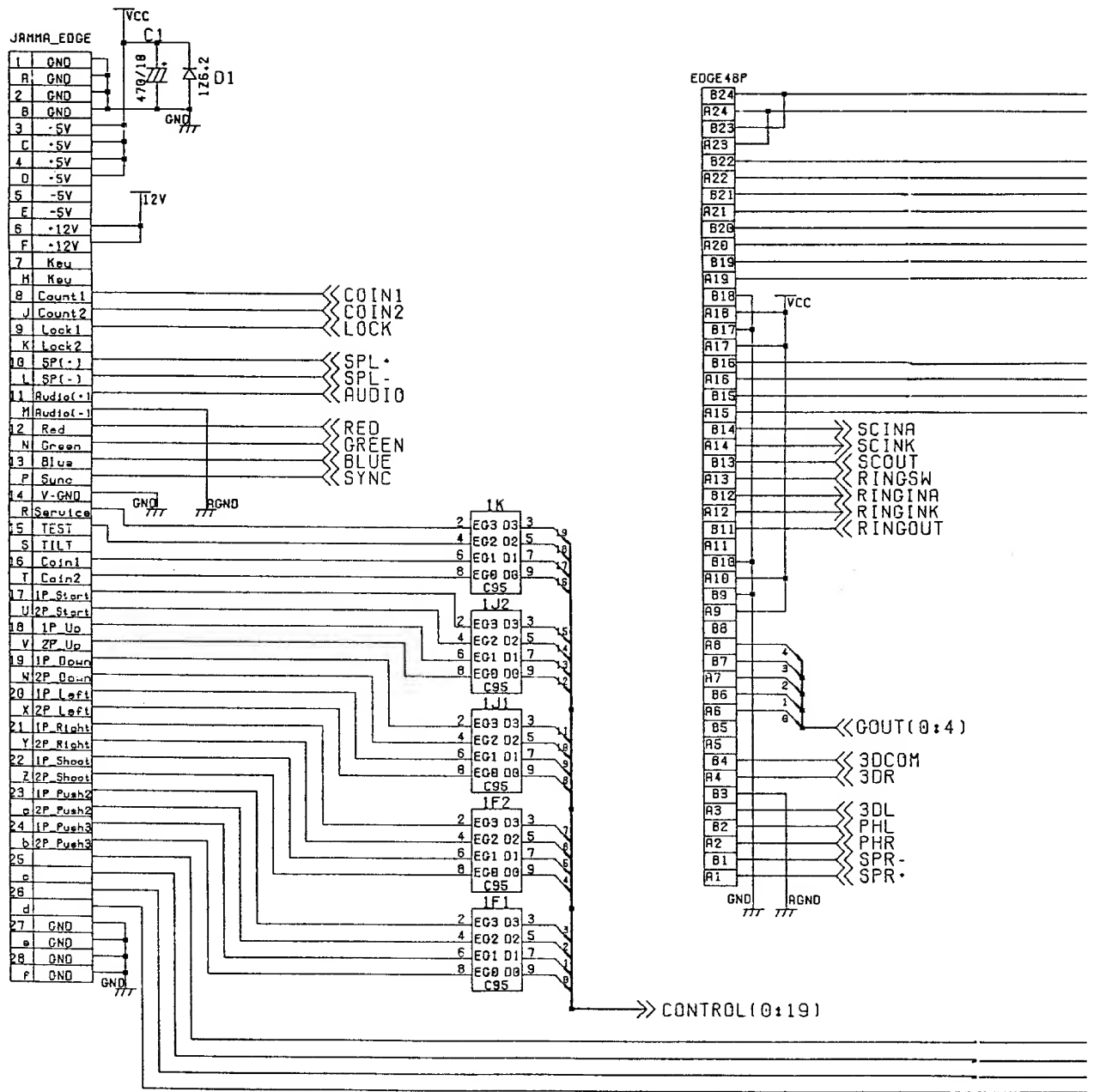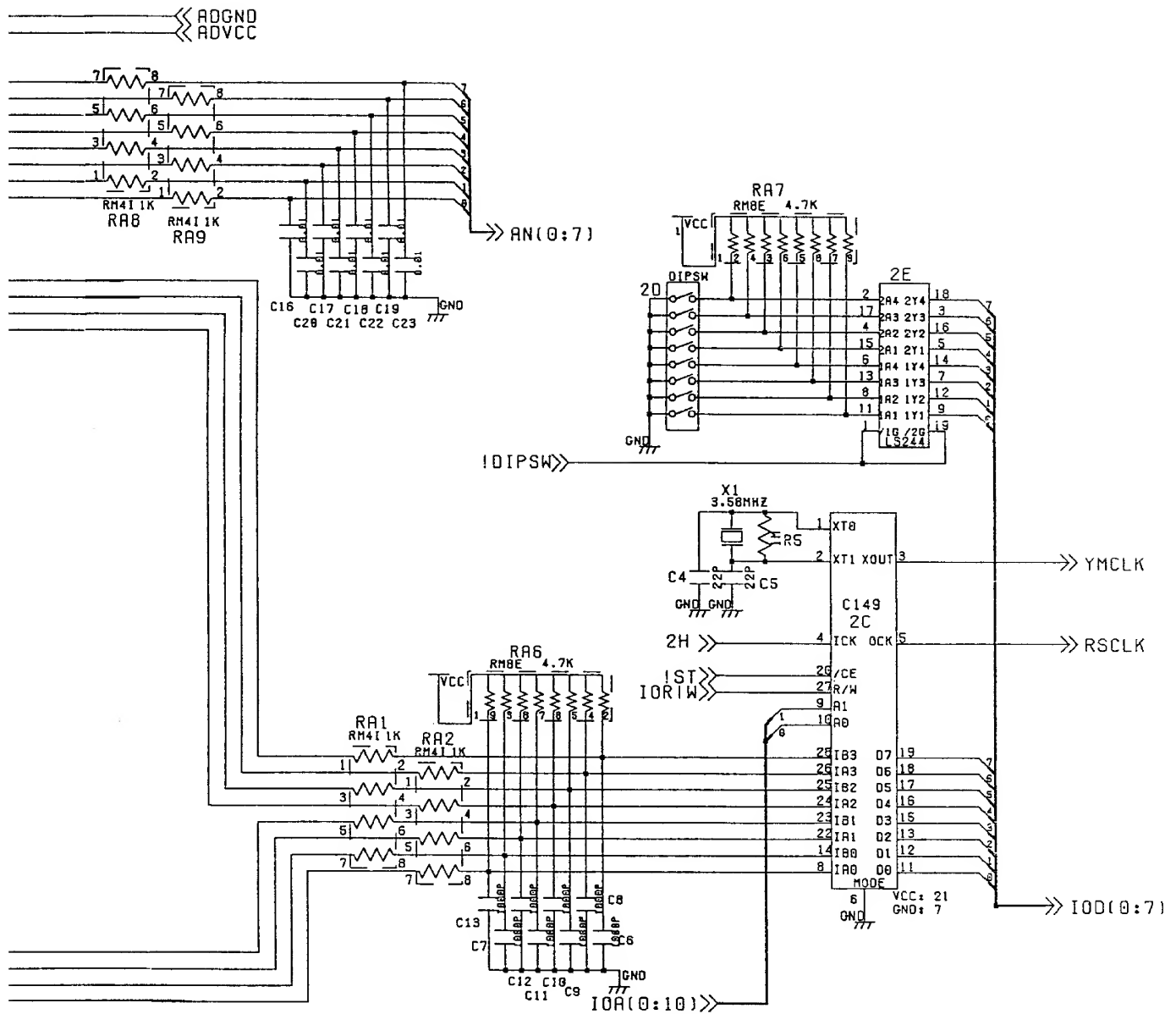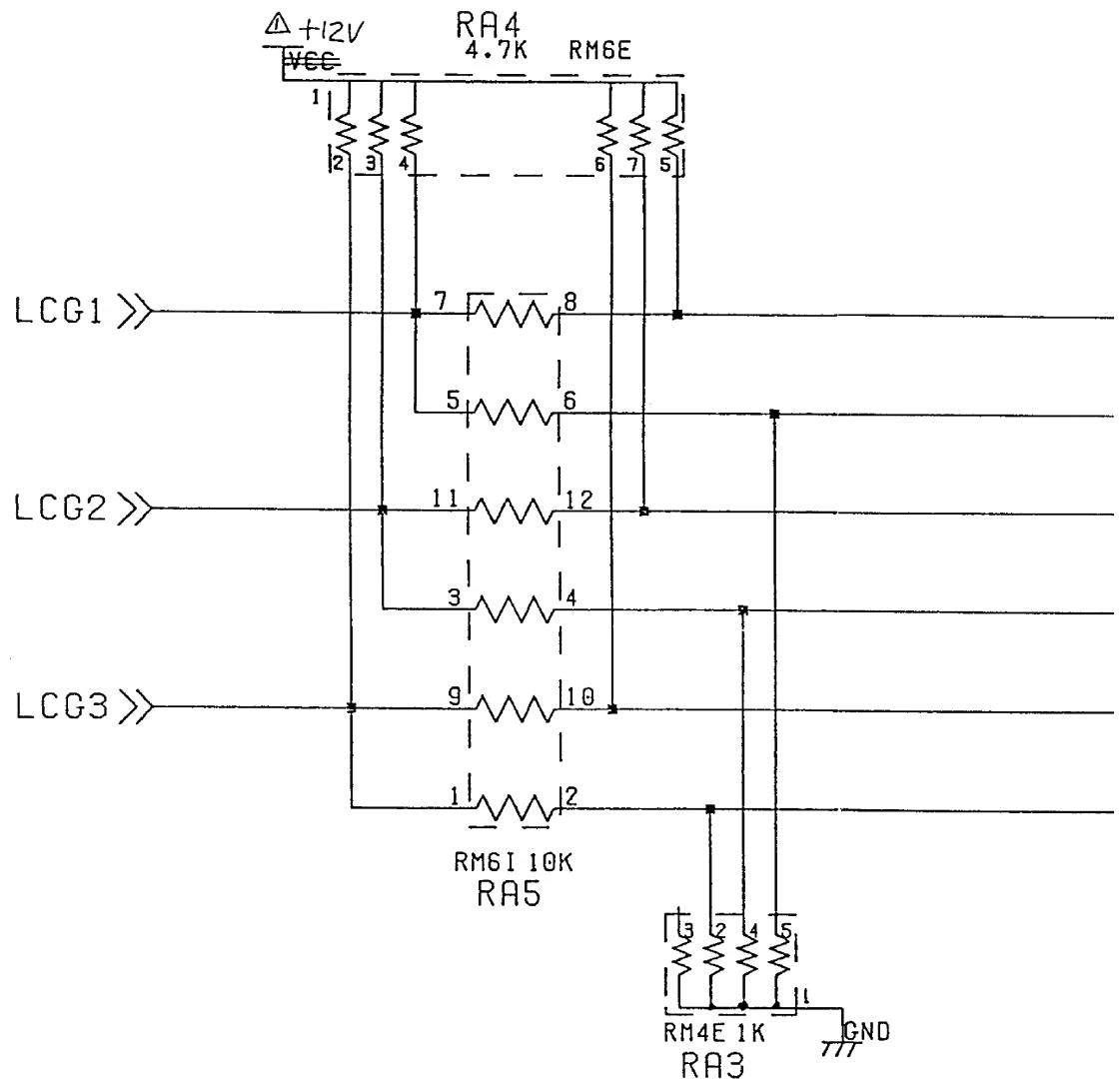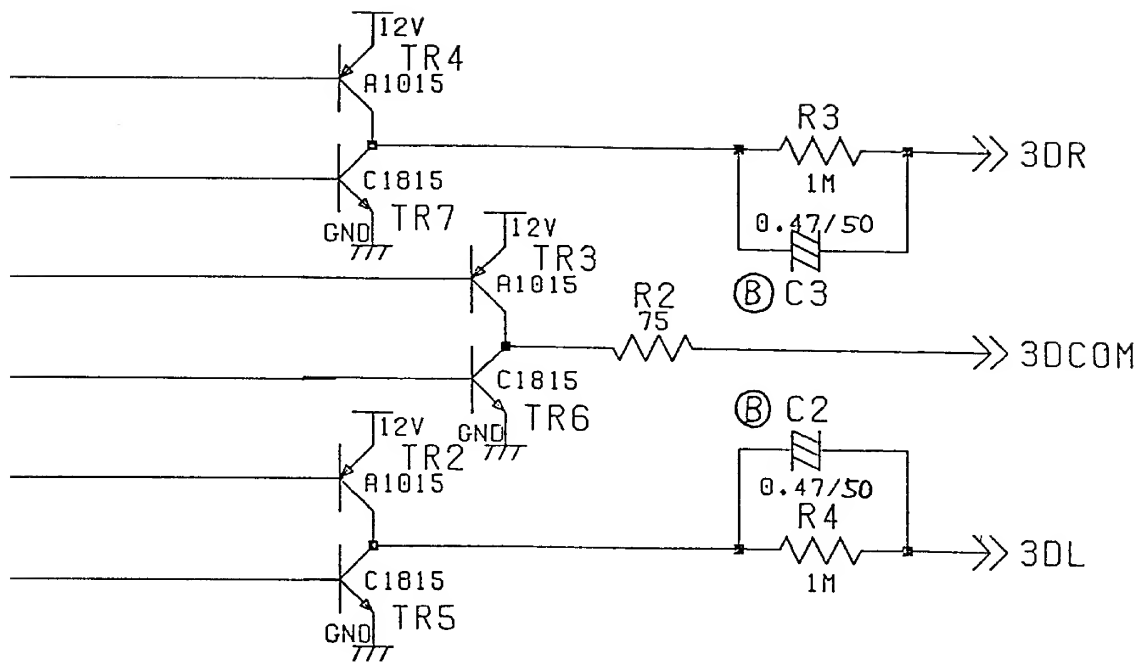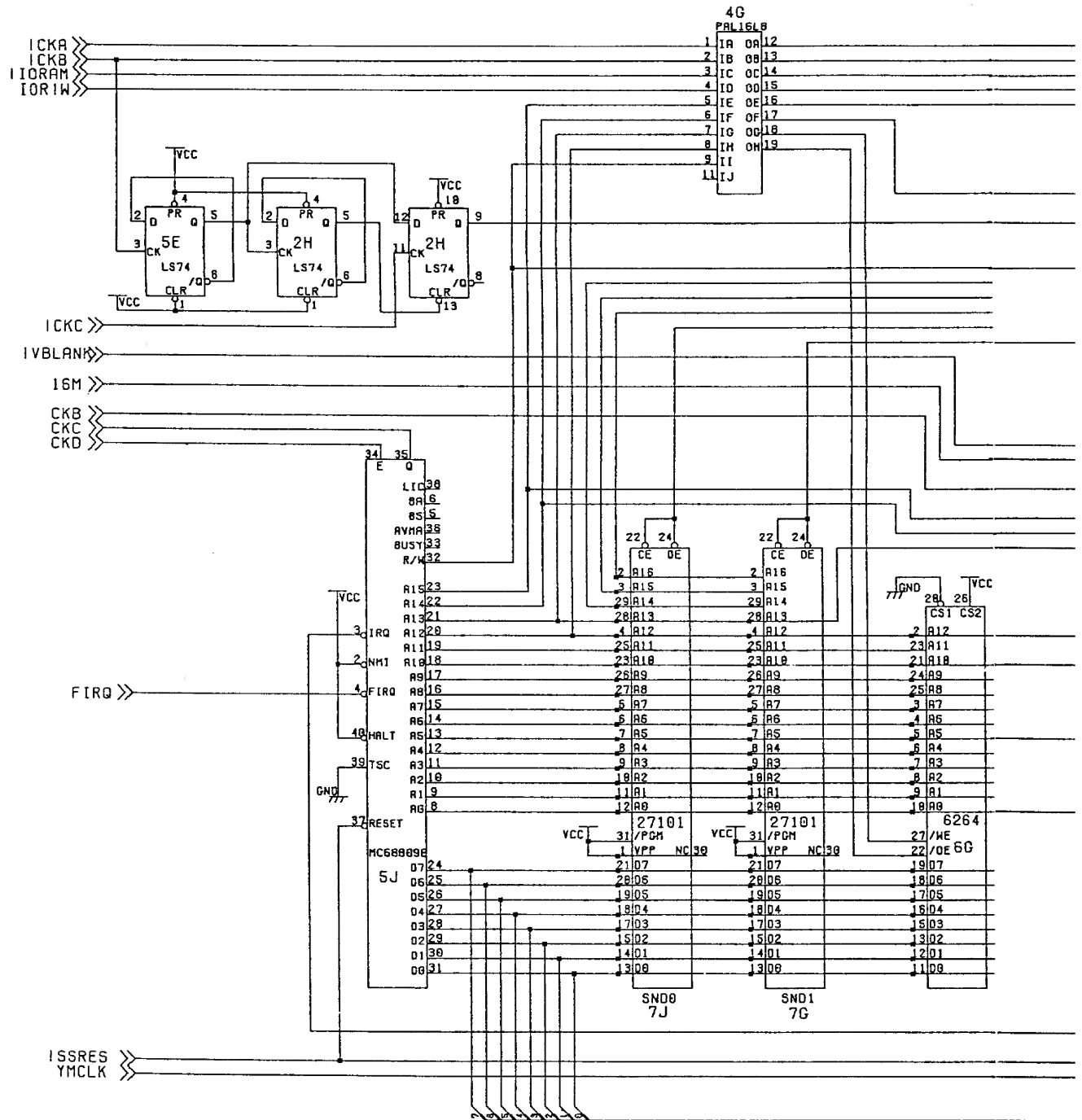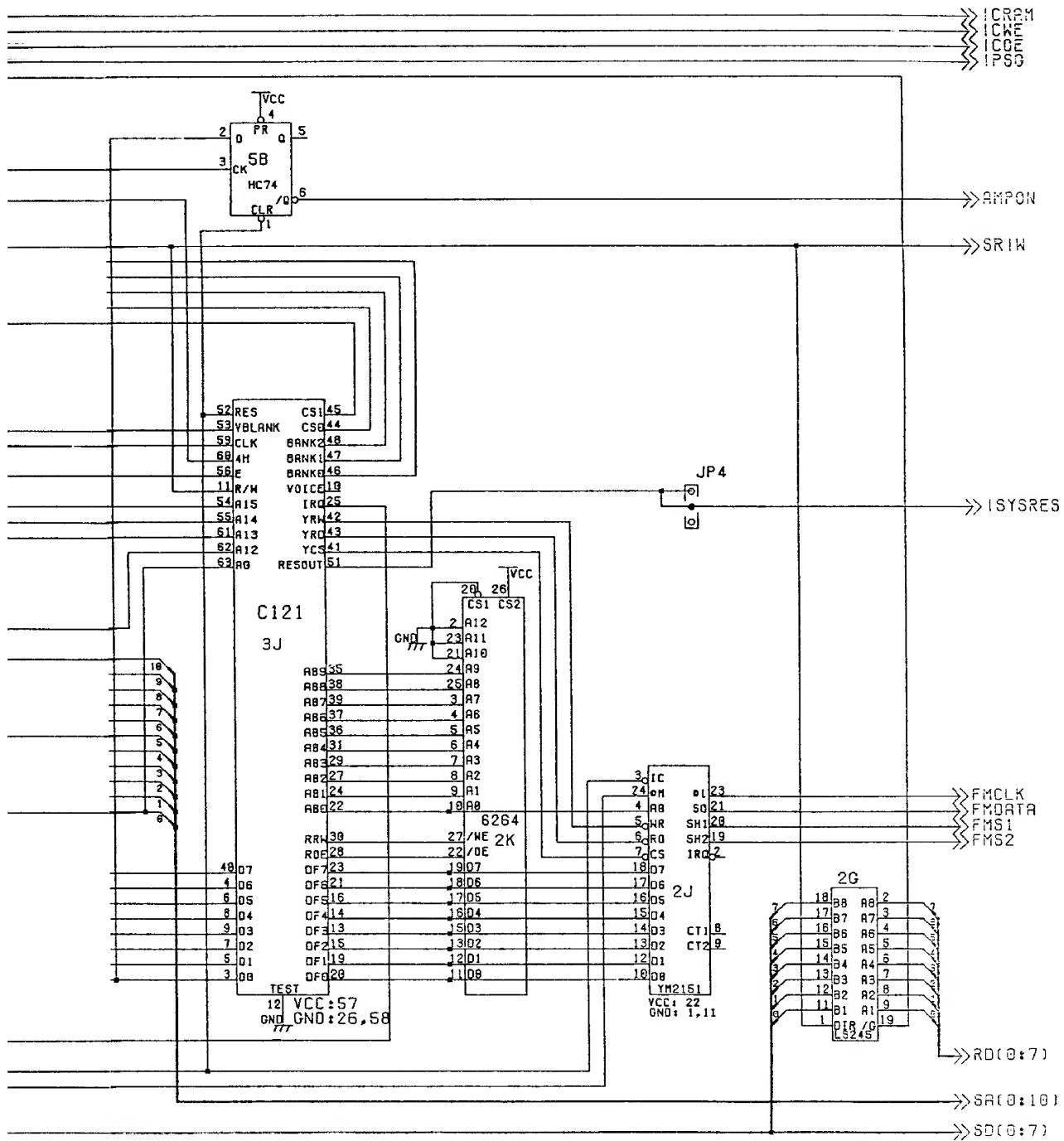
Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 16)

99-090462

GND

107

WORD

24 VBNK   INT1 12
106 RMCK   INT0 13
99 CK8
102 CTS

9 CS   BCLK 94
10 R/W   WCLK 95
11 WE   LRCK 96
            DATA 97

119 A9
8 A8   D2M 101
7 A7   SRCK 103
6 A6
5 A5   VOL1 108 VCC
4 A4   VOL0 109
3 A3
2 A2   LIMIT 93
1 A1
120 A0

12M
8M

IPSG
SRIW
ICKD

C140
2M

23 D15
22 D14
21 D13
20 D12
19 D11
18 D10
17 D9
16 D8   MA23 92
117 D7   MA22 91
116 D6   MA21 90
115 D5   MA20 89
114 D4   MA19 88
113 D3   MA18 87
112 D2   MA17 86
111 D1   MA16 85
110 D0   MA15 84
            MA14 83
118 RA9   MA13 82
33 RA8   MA12 81
32 RA7   MA11 80
31 RA6   MA10 79
30 RA5   MA9 78
29 RA4   MA8 77
28 RA3   MA7 76
27 RA2   MA6 73
26 RA1   MA5 72
            MA4 71
53 UWR   MA3 70
52 ROE   MA2 69
51 RD15   MA1 68
50 RD14   MA0 67
49 RD13
48 RD12
47 RD11
46 RD10   MD11 55
43 RD9   MD10 56
42 RD8   MD9 57
            MD8 58
54 LWR   MD7 59
41 RD7   MD6 60
40 RD6   MD5 61
39 RD5   MD4 62
38 RD4
37 RD3   MD3 63
36 RD2   MD2 64
35 RD1   MD1 65
34 RD0   MD0 66

SA(0:10)

SD(0:7)

GND 18
CS
A10 19
A9 22
A8 23
A7 1
A6 2
A5 3
A4 4
A3 5
A2 6
A1 7
A0 8

2018
/WE 21
/OE 20

5L

R59 R60
270 270

100P C84
GND

C85

100P
GND

GND 18
CS
A10 19
A9 22
A8 23
A7 1
A6 2
A5 3
A4 4
A3 5
A2 6
A1 7
A0 8

2018
/WE 21
/OE 20

5M

D7 17
D6 16
D5 15
D4 14
D3 13
D2 11
D1 10
D0 9

D7 17
D6 16
D5 15
D4 14
D3 13
D2 11
D1 10
D0 9

VCC: 14,44,74,104
GND: 15,45,75,105

TCLR TEST
100   25
GND
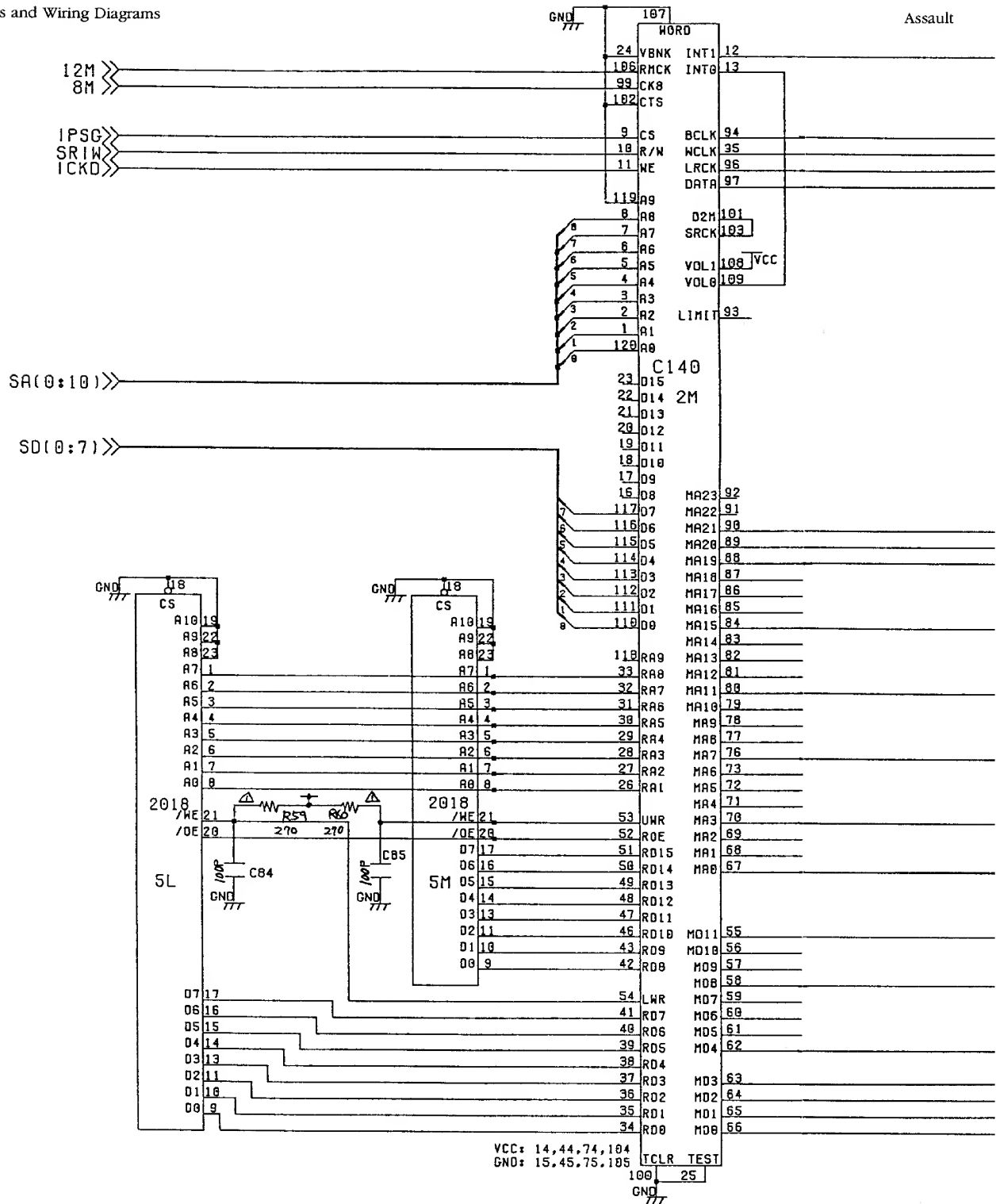
Figure 5-1
Assault™ CPU PCB Assembly
Schematic Diagram
(Sheet 17)

99-090462

A5V

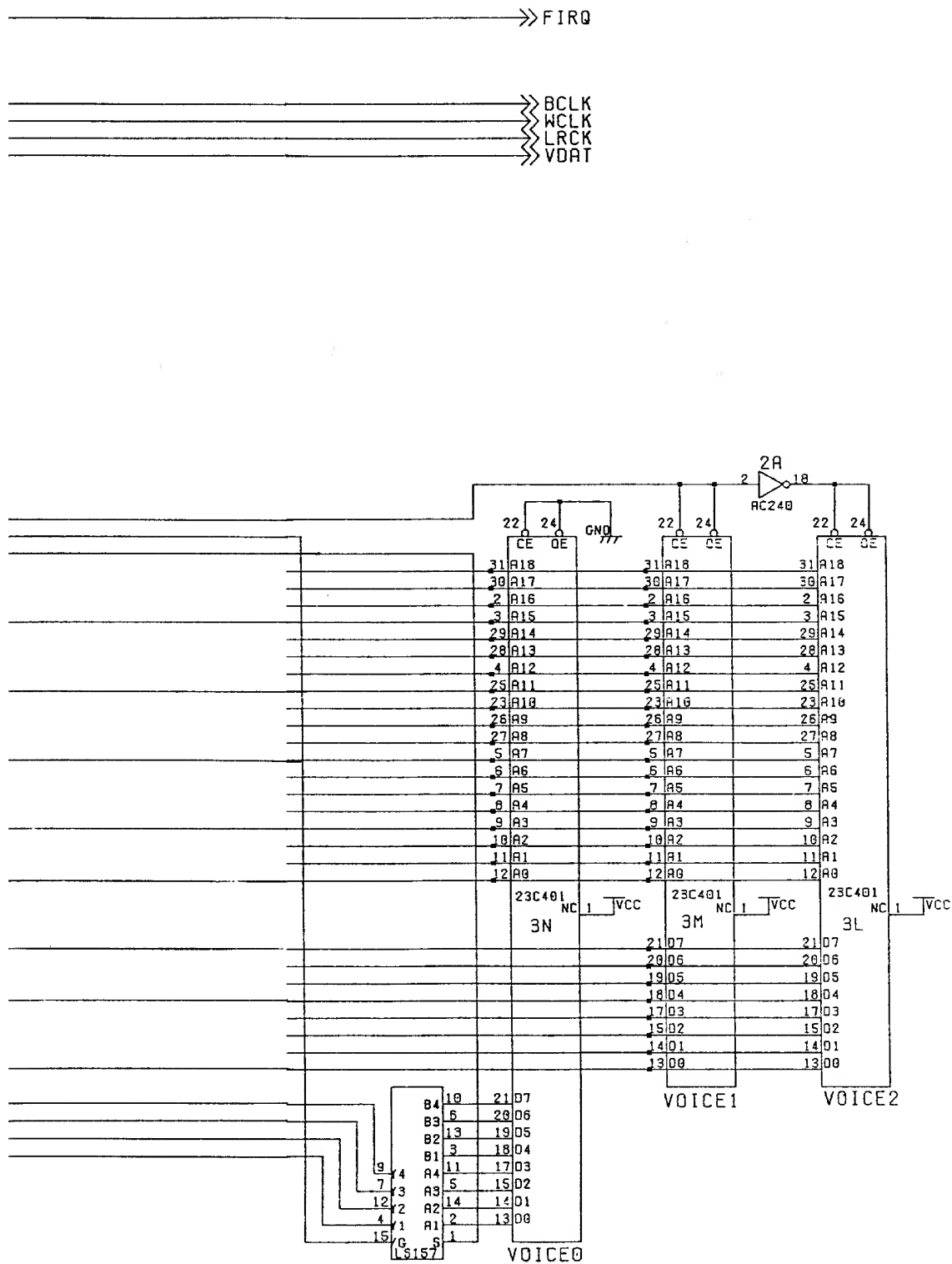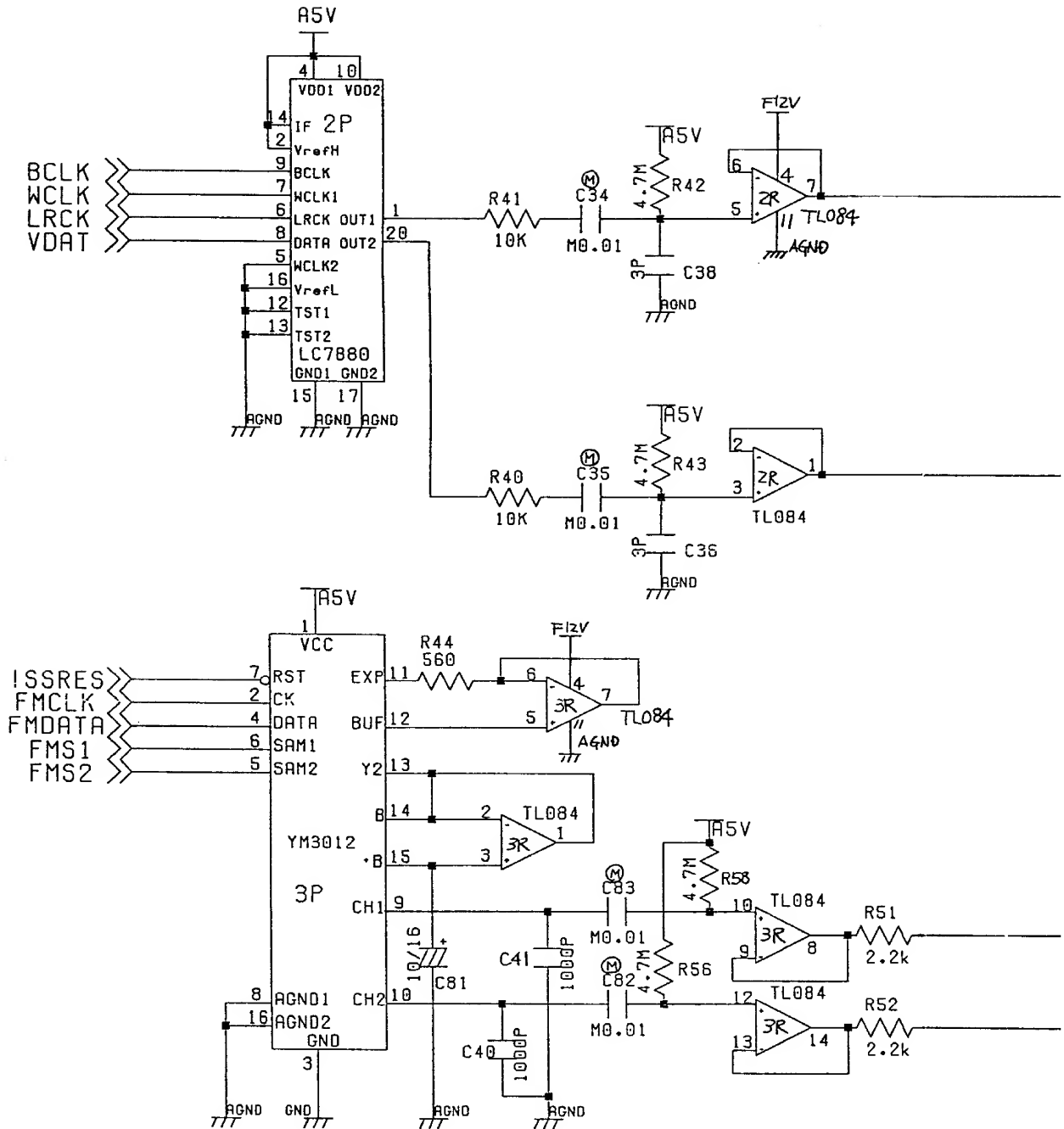4 10
VDD1 VDD2

14 IF 2P
2   VrefH
9   BCLK
7   WCLK1
6   LRCK OUT1
8   DATA OUT2
5   WCLK2
16 VrefL
12 TST1
13 TST2
LC7880
GND1 GND2

BCLK
WCLK
LRCK
VDAT

1
20

R41
10K

C34
M0.01

A5V

R42
4.7M

6
4 7
5 2R
11 TL084

C38
3P

AGND

F12V

AGND

15 17
AGND AGND AGND

R40
10K

C35
M0.01

A5V

R43
4.7M

2
1
3 2R
TL084

C36
3P

AGND

A5V

1
VCC

!SSRES
FMCLK
FMDATA
FMS1
FMS2

7 RST
2 CK
4 DATA
6 SAM1
5 SAM2

EXP 11

BUF 12

R44
560

F12V

6
4 7
5 3R
TL084

AGND

Y2 13

B 14
2
TL084
1
•B 15
3 3R

YM3012

3P

CH1 9

A5V

C83
M0.01

R58
4.7M

10
TL084
8
3R

R51
2.2k

10/16
C81

C41
1000P

C82
M0.01

R56
4.7M

12
TL084
14
3R

R52
2.2k

8 AGND1
16 AGND2
GND

CH2 10

C40
1000P

13

3

AGND   GND

AGND   AGND

Figure 5-1
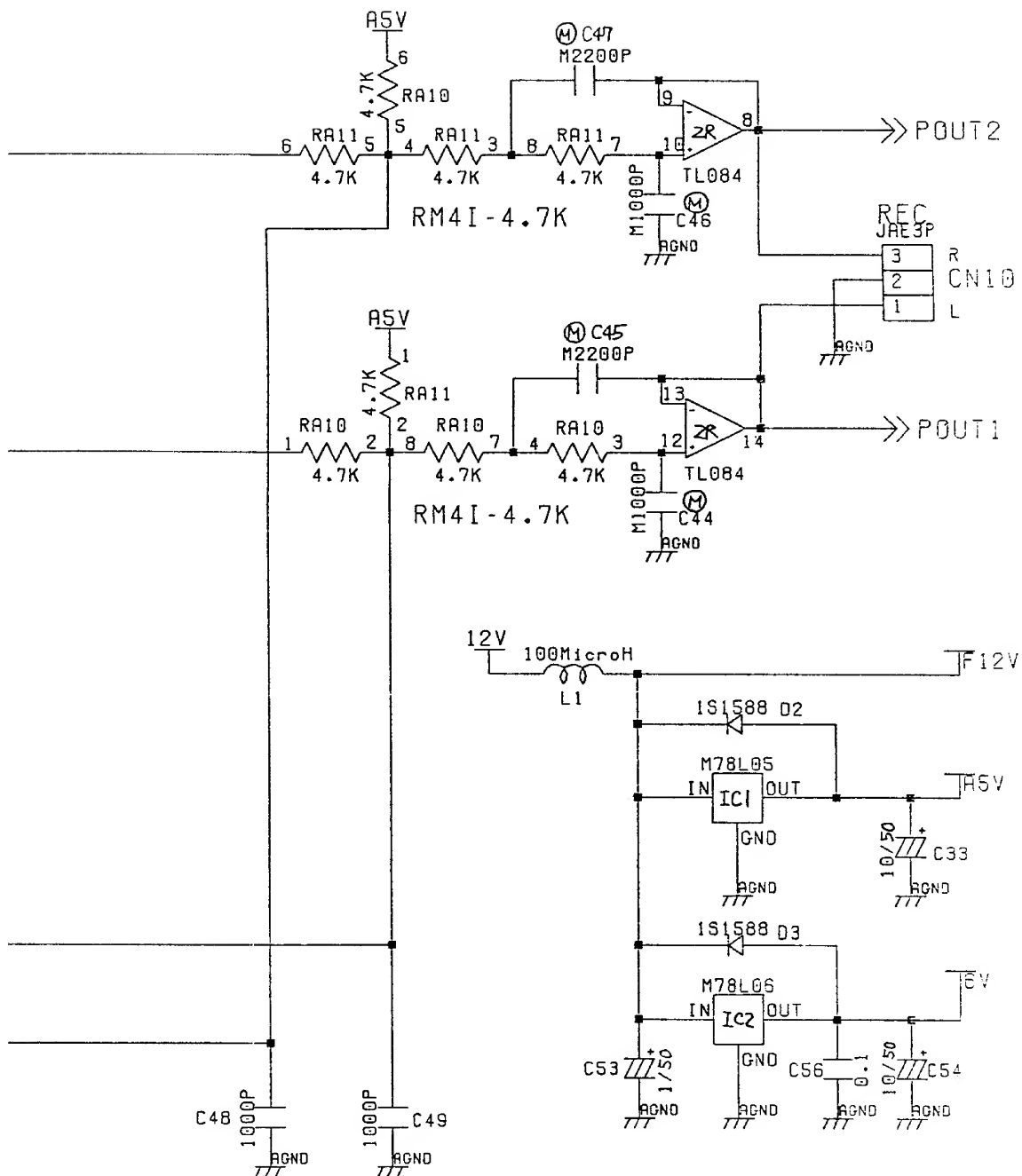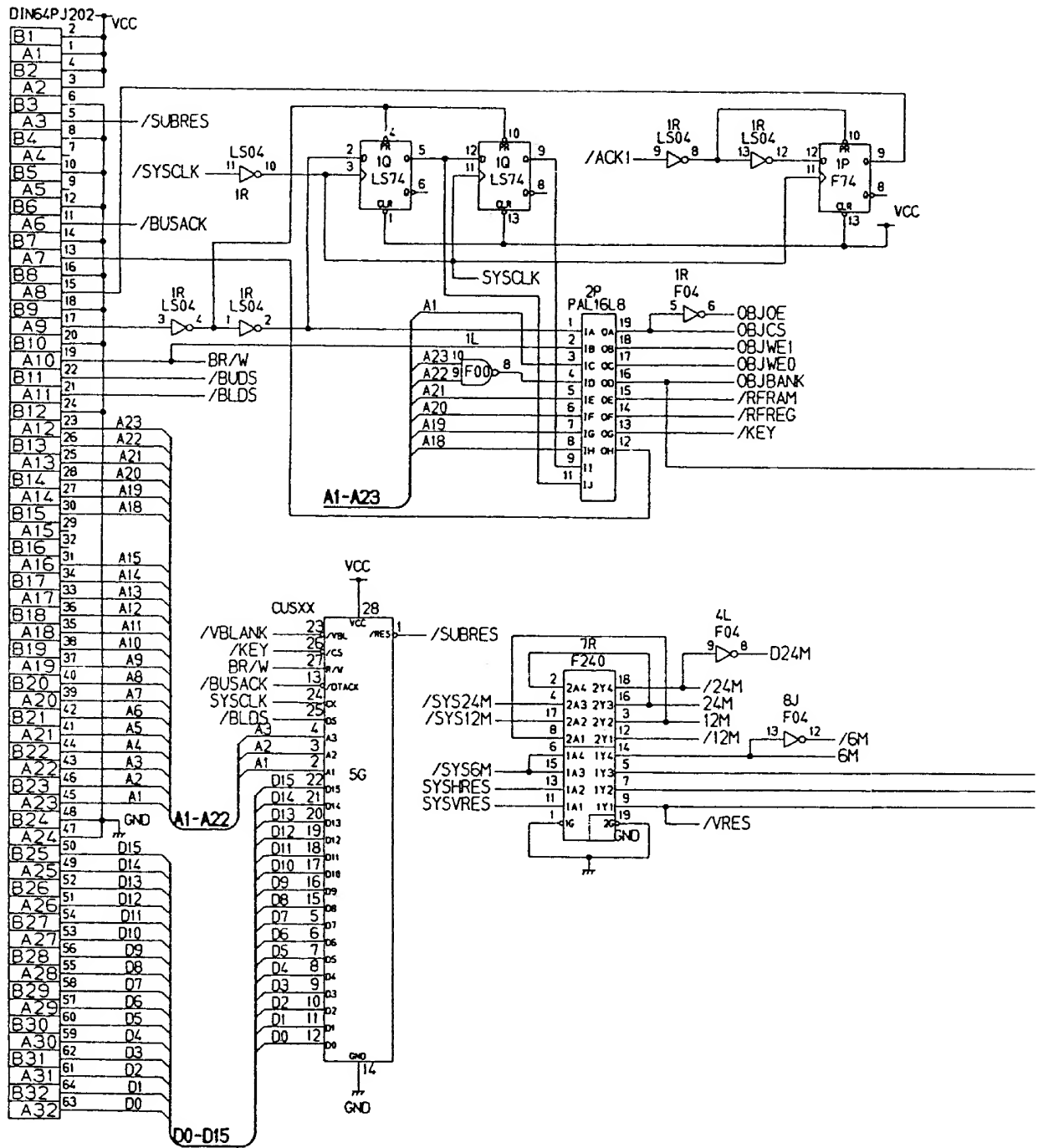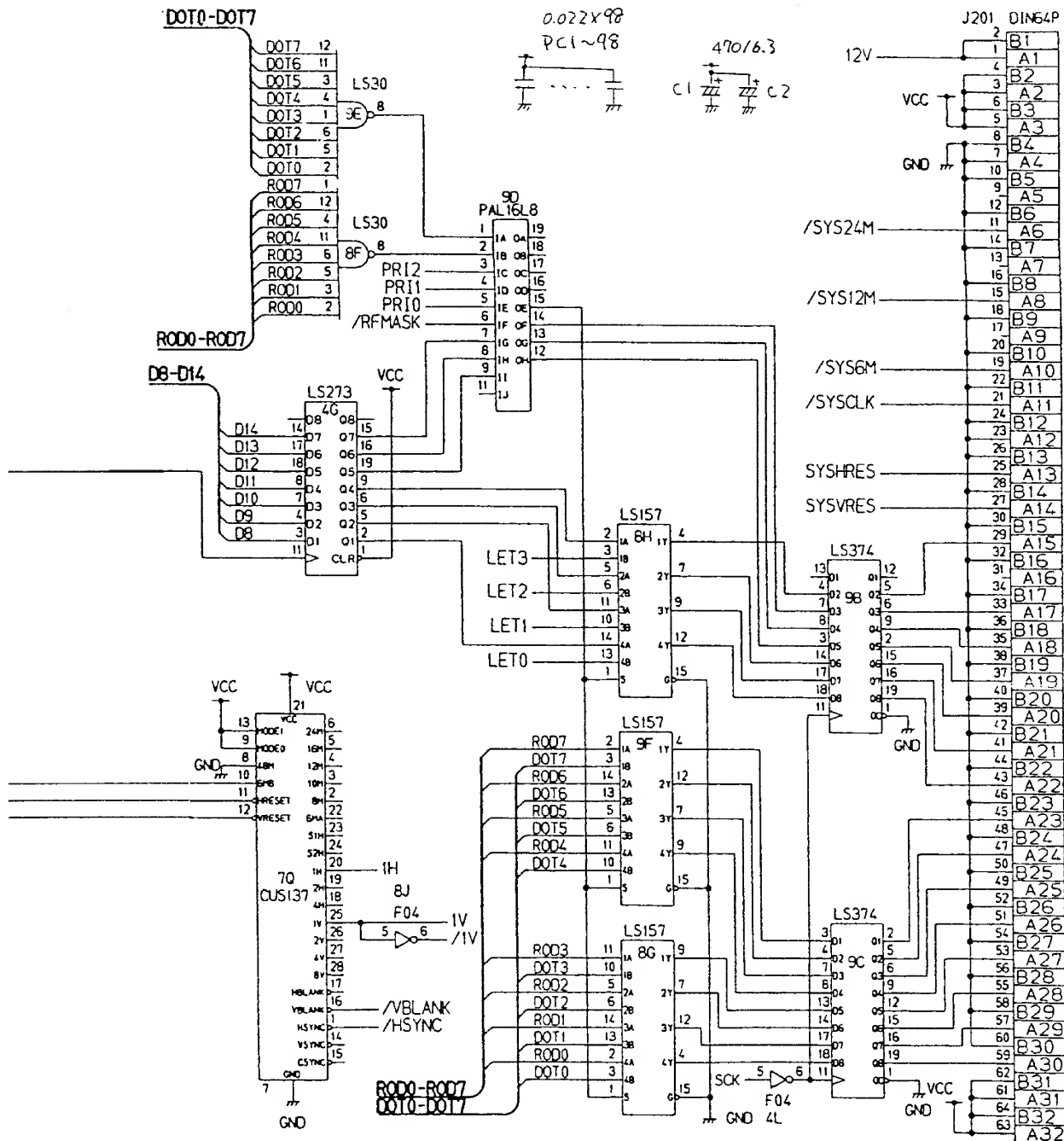**Assault™ CPU PCB Assembly**
Schematic Diagram
(Sheet 18)

DIN64PJ202

/SUBRES
LS04
/SYSCLK
1R
/BUSACK

/ACK1
1R LS04
1R LS04
1P F74
VCC

SYSCLK

1R LS04
1R LS04
BR/W
/BUDS
/BLDS

2P PAL16L8
1L
A23 F00
A22
A21
A20
A19
A18

1R F04
OBJOE
OBJCS
OBJWE1
OBJWE0
OBJBANK
/RFRAM
/RFREG
/KEY

A1-A23

VCC

CUSXX
/VBLANK
/KEY
BR/W
/BUSACK
SYSCLK
/BLDS

/SUBRES

4L F04
D24M

7R F240
/SYS24M
/SYS12M

/24M
24M
12M
/12M

8J F04
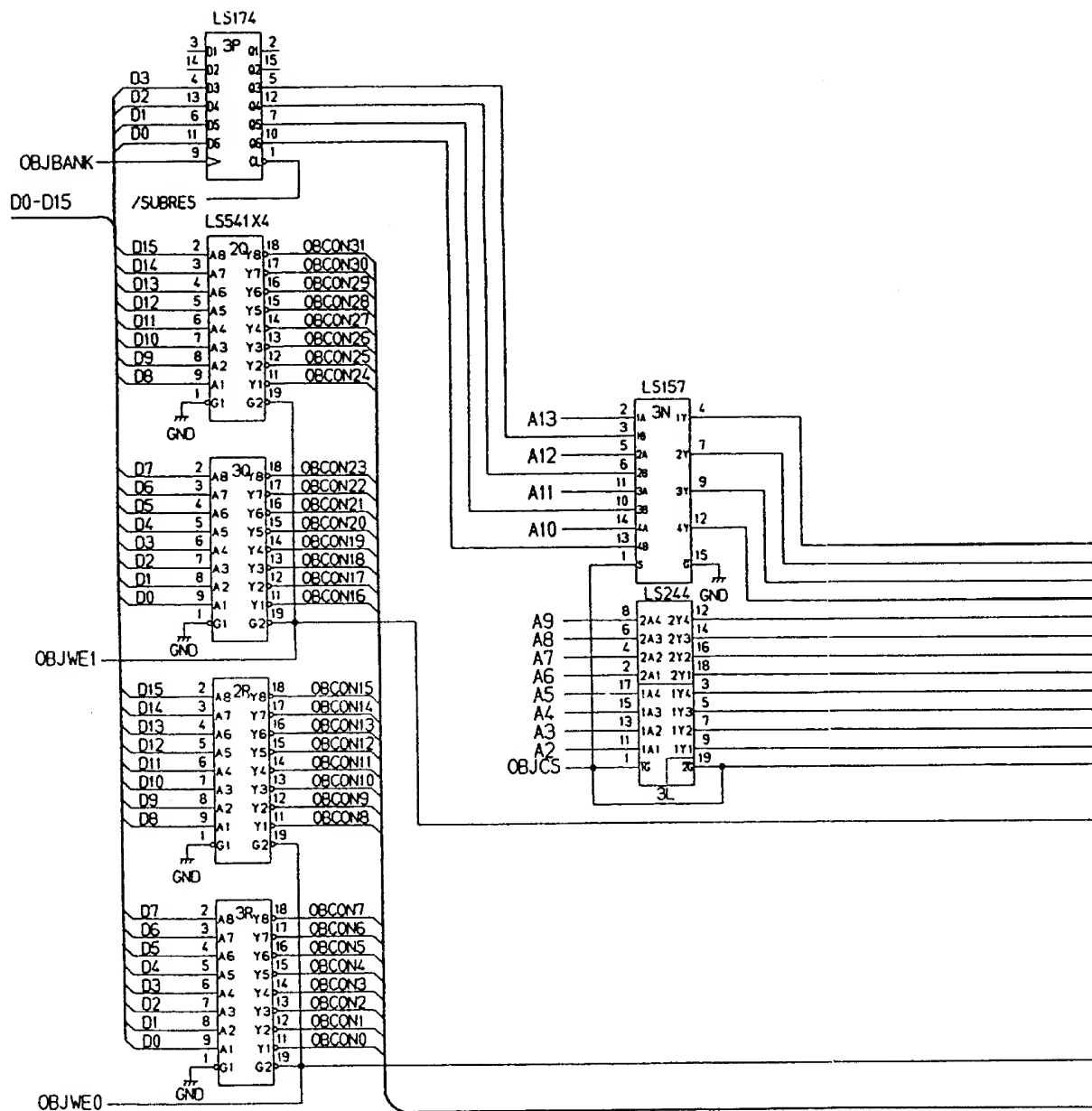/6M
6M

/SYS6M
SYSHRES
SYSVRES

/VRES

A1-A22

D0-D15

GND

SYSTEM CONNECTOR

Figure 5-2
Assault™ Video PCB Assembly
Schematic Diagram
(Sheet 1)

LS174

3P

D3
D2
D1
D0
OBJBANK

/SUBRES

D0-D15

LS541 X4

D15   2Q   OBCON31
D14   OBCON30
D13   OBCON29
D12   OBCON28
D11   OBCON27
D10   OBCON26
D9   OBCON25
D8   OBCON24
GND

LS157

3N

A13
A12
A11
A10

D7   3Q   OBCON23
D6   OBCON22
D5   OBCON21
D4   OBCON20
D3   OBCON19
D2   OBCON18
D1   OBCON17
D0   OBCON16
GND

OBJWE1

LS244

A9
A8
A7
A6
A5
A4
A3
A2
OBJCS

3L

D15   2R   OBCON15
D14   OBCON14
D13   OBCON13
D12   OBCON12
D11   OBCON11
D10   OBCON10
D9   OBCON9
D8   OBCON8
GND

D7   3R   OBCON7
D6   OBCON6
D5   OBCON5
D4   OBCON4
D3   OBCON3
D2   OBCON2
D1   OBCON1
D0   OBCON0
GND

OBJWE0

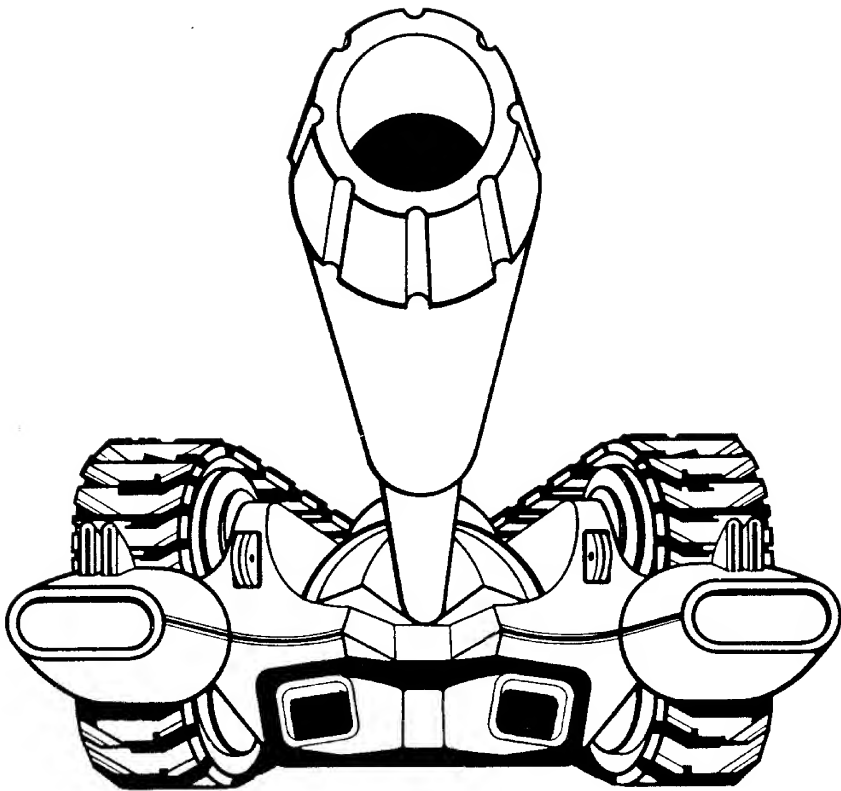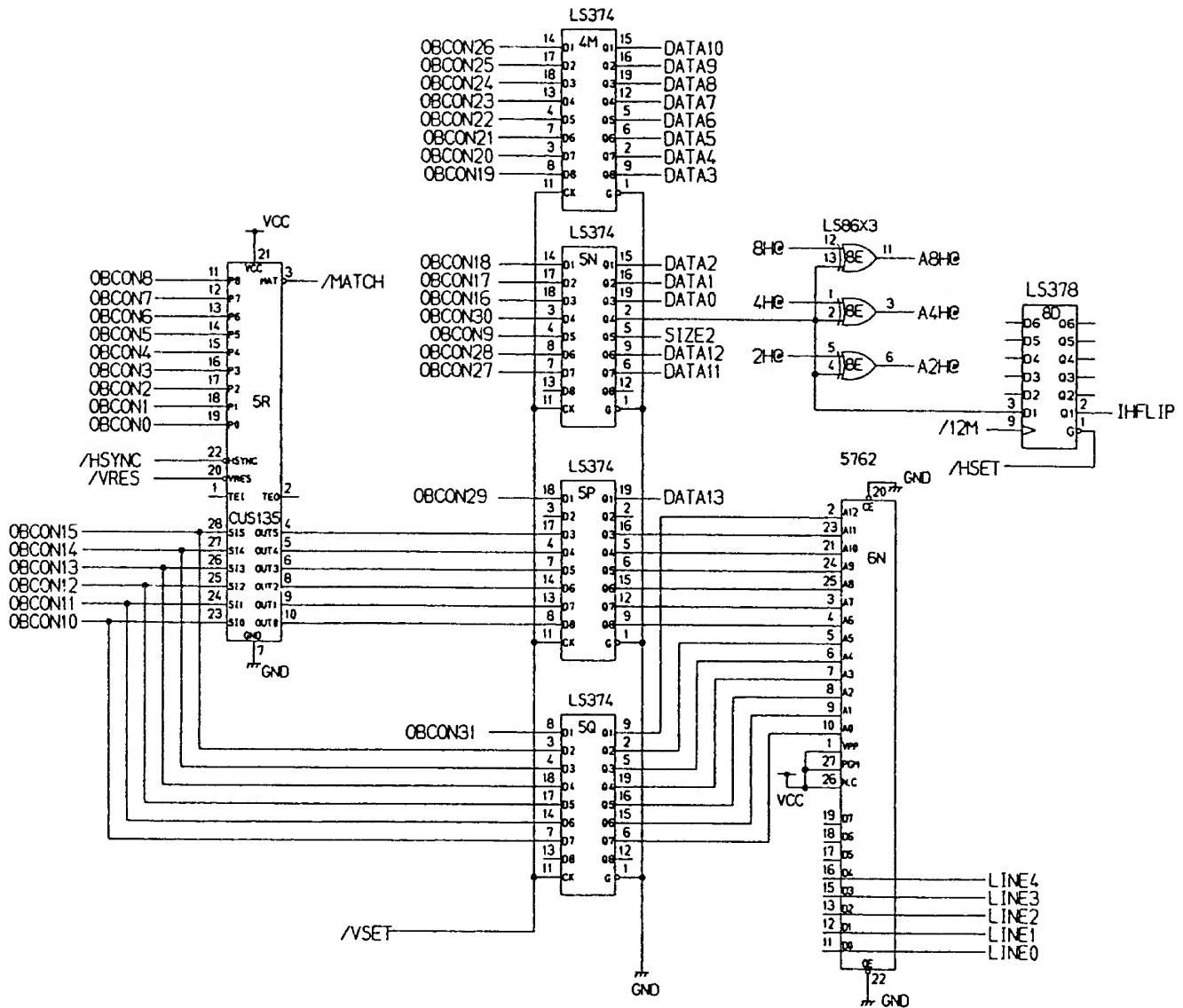**OBJECT CONTROLLER**

Figure 5-2
Assault™ Video PCB Assembly
Schematic Diagram
(Sheet 2)

99-090463

V LINE

**Figure 5-2
Assault™ Video PCB Assembly
Schematic Diagram
(Sheet 3)**

99-090463

OBJ ROM

Figure 5-2
Assault™ Video PCB Assembly
Schematic Diagram
(Sheet 4)

99-090463

DUAL LINE BUFFER

Figure 5-2
Assault™ Video PCB Assembly
Schematic Diagram
(Sheet 5)

LINE BUFFER SCROLLER

Figure 5-2
Assault™ Video PCB Assembly
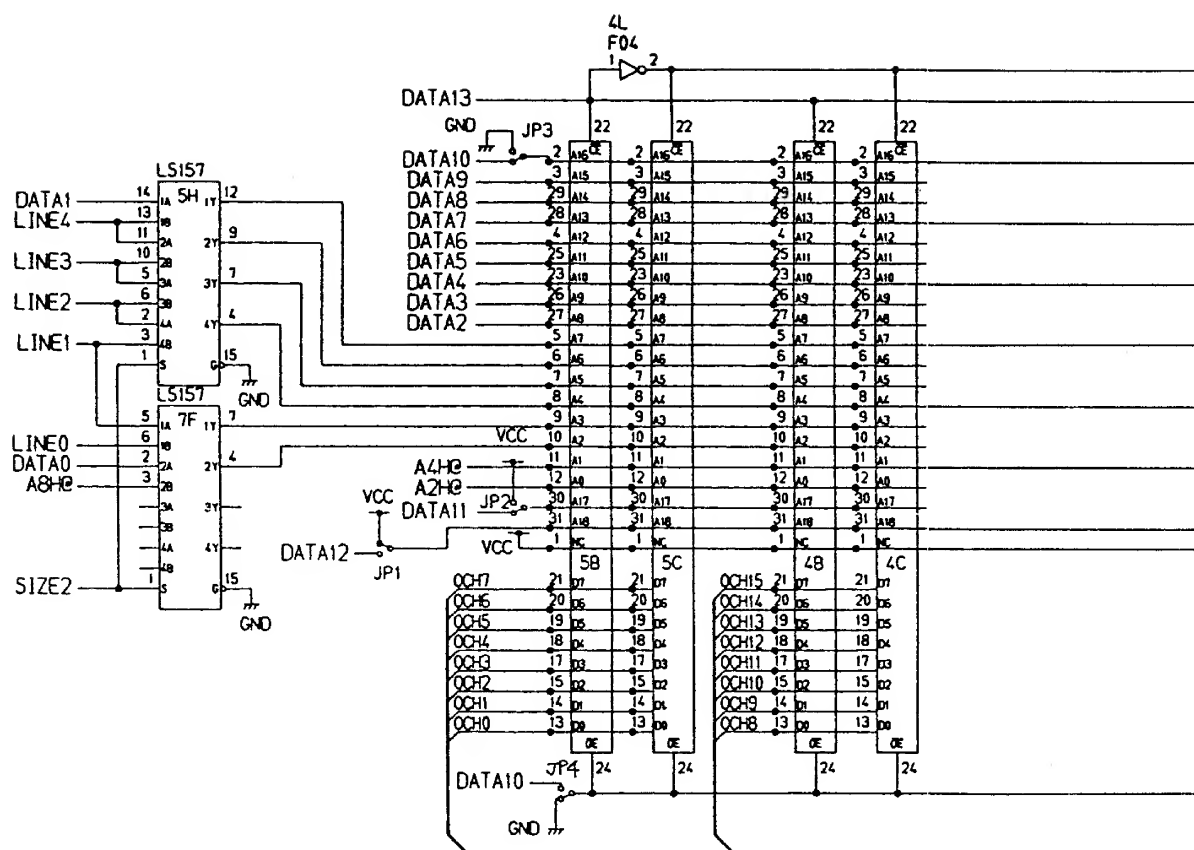**Schematic Diagram**
(Sheet 6)

REVOLUTION & SCROLL
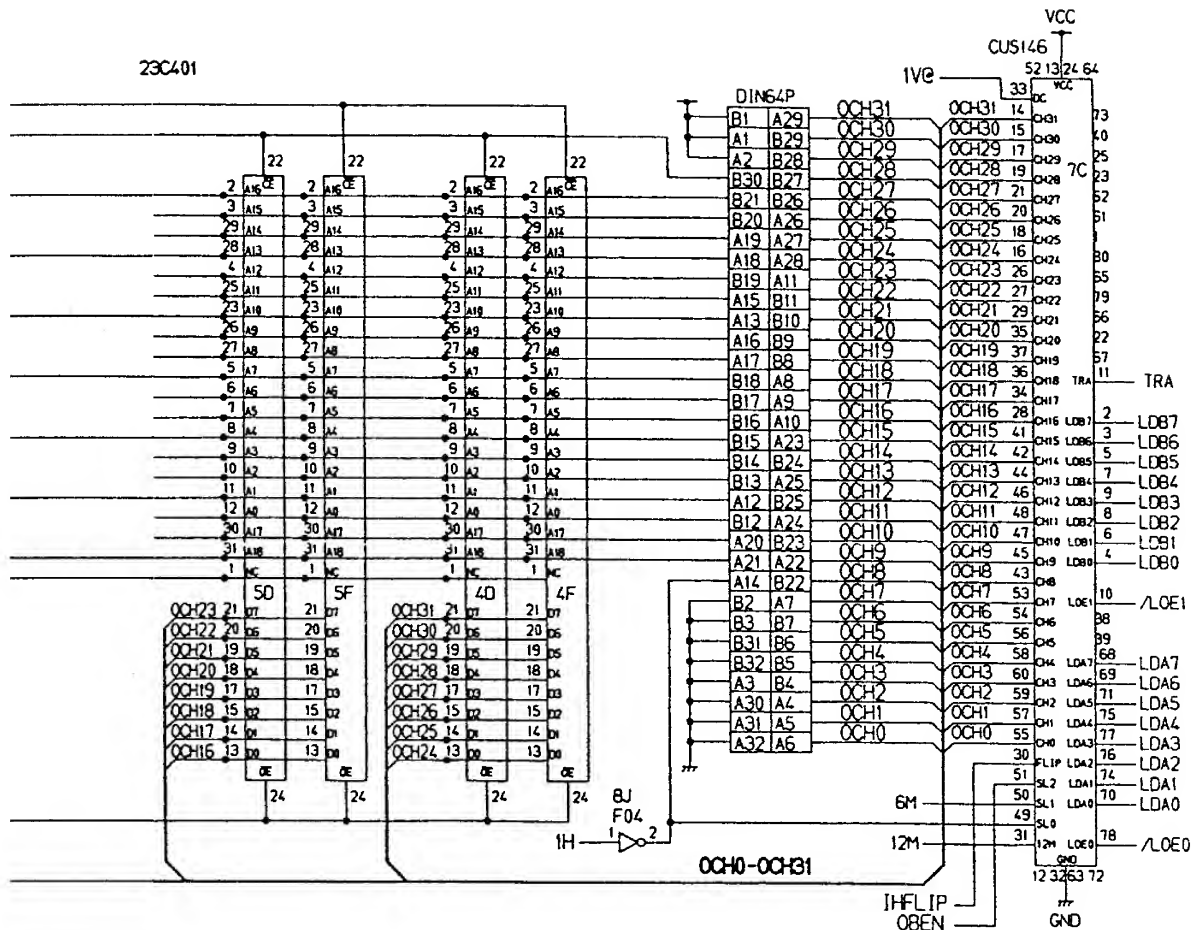
Figure 5-2
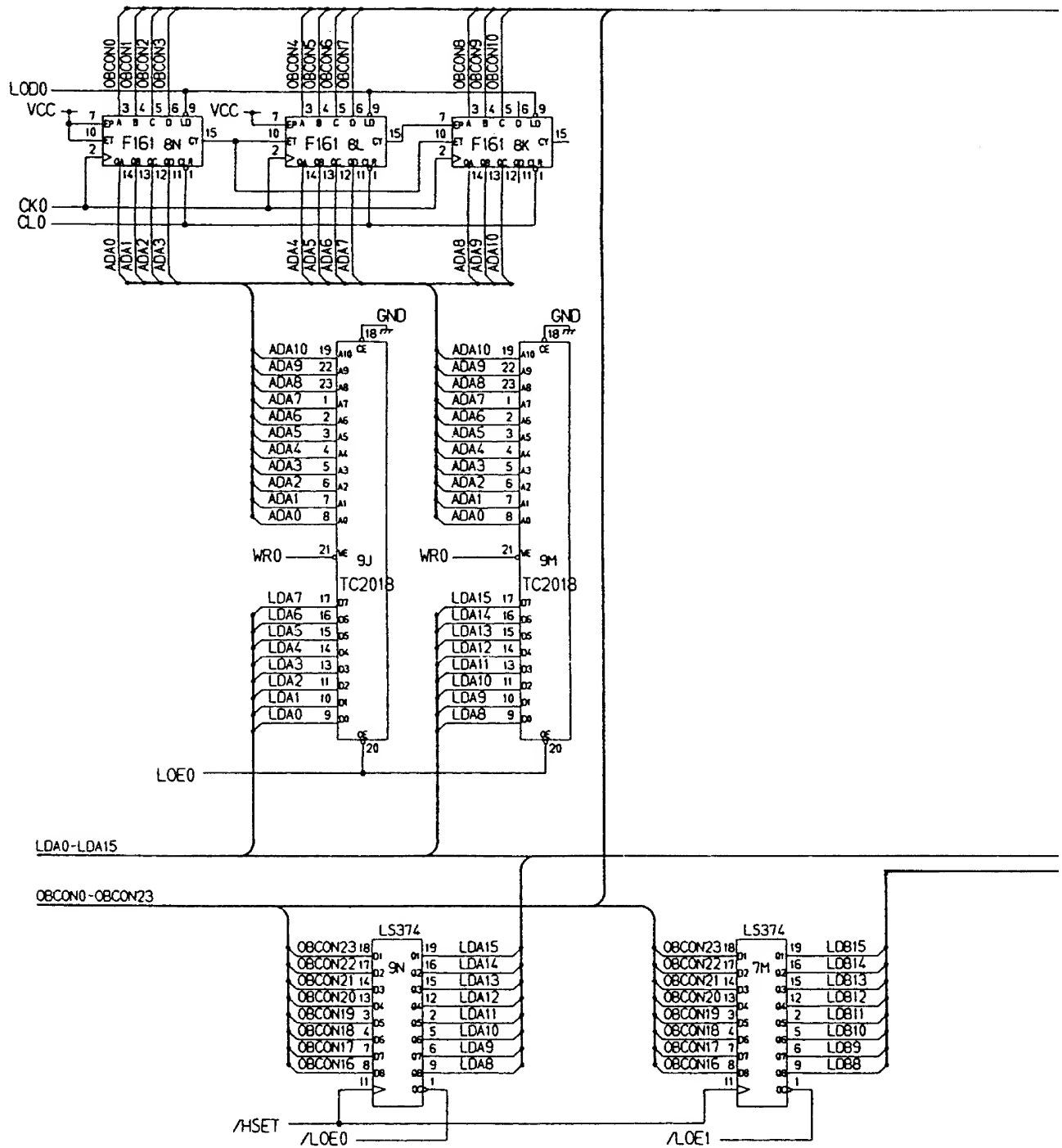**Assault™ Video PCB Assembly**
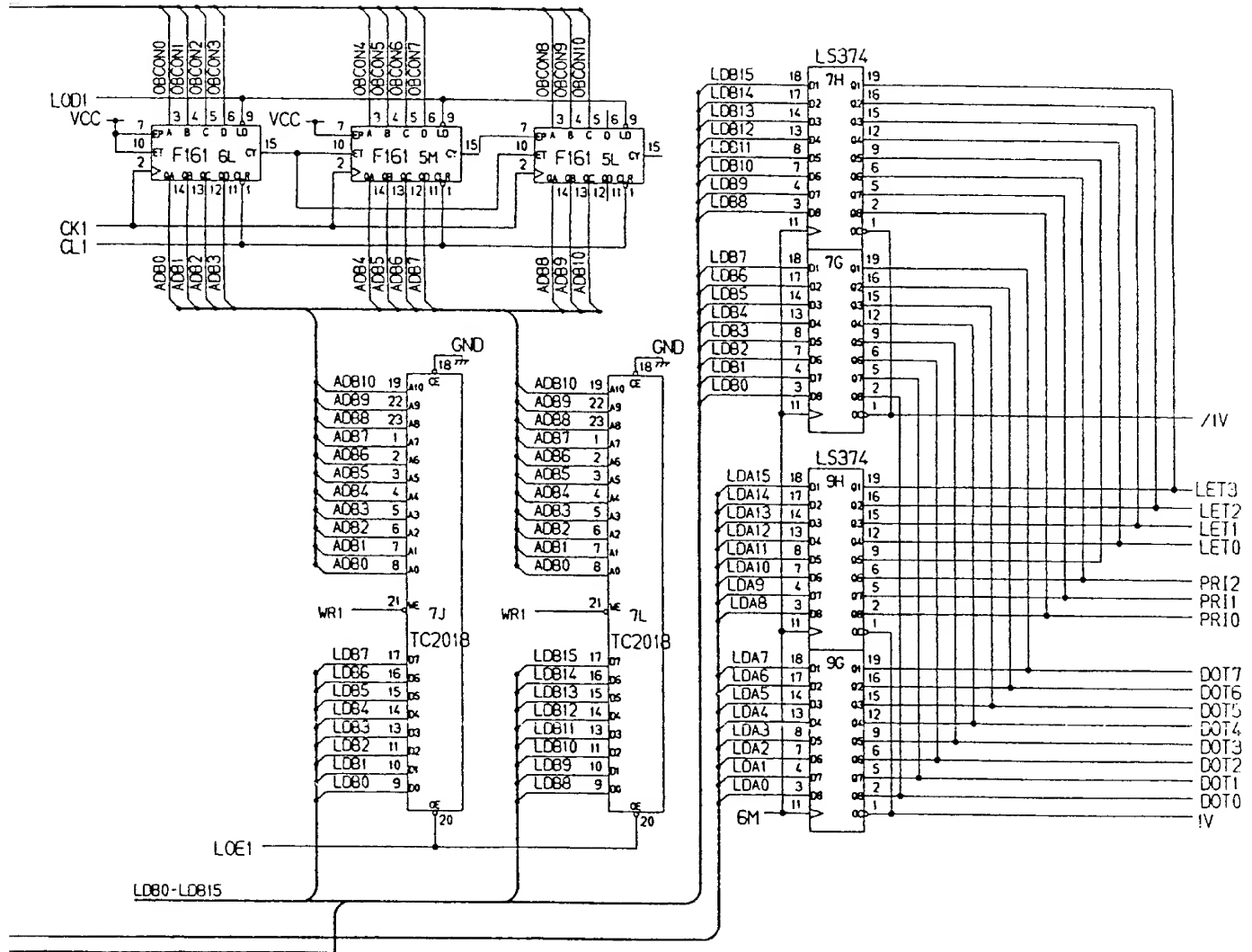**Schematic Diagram**
(Sheet 7)

99-090463

ROZ ROM

**Figure 5-2
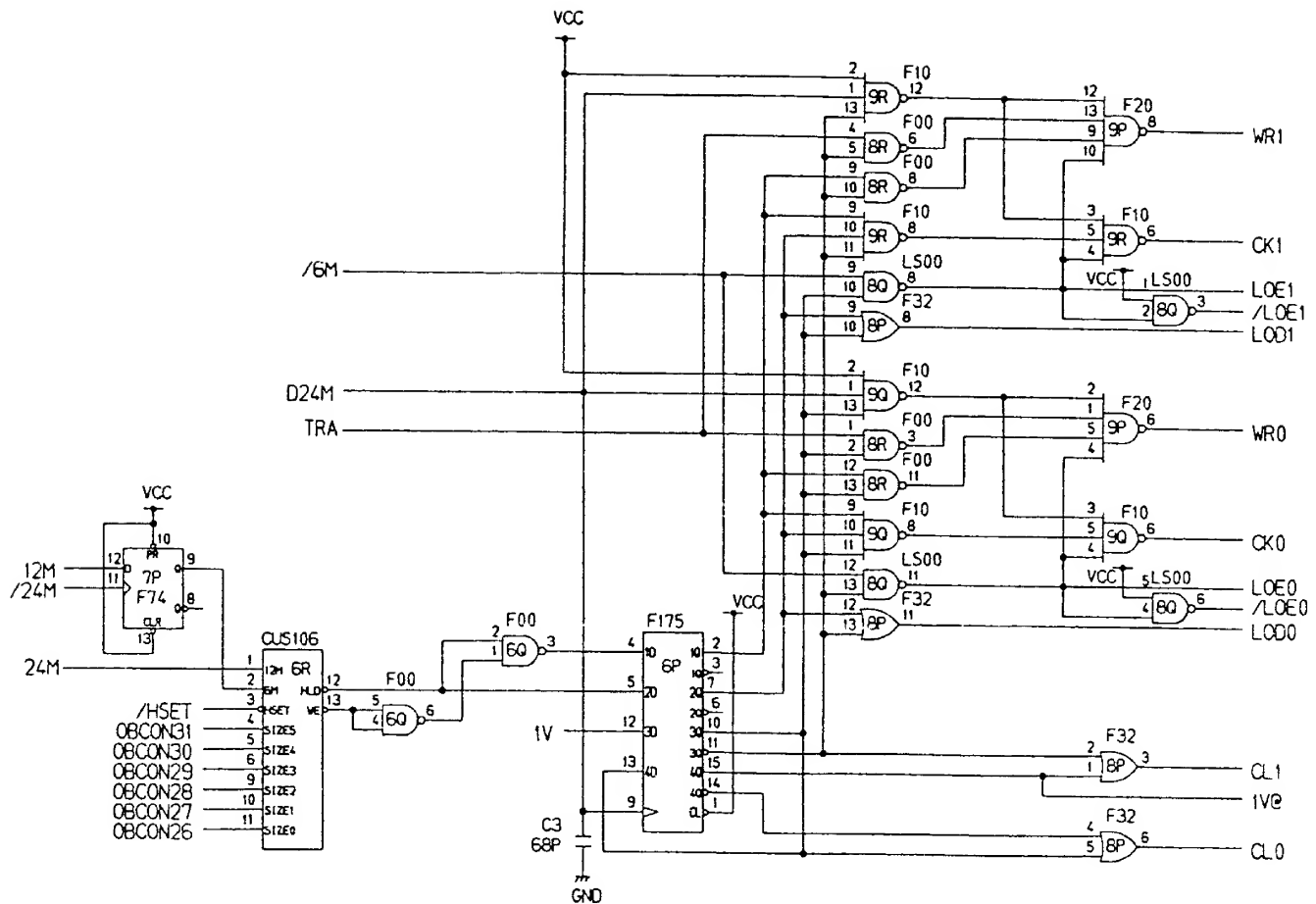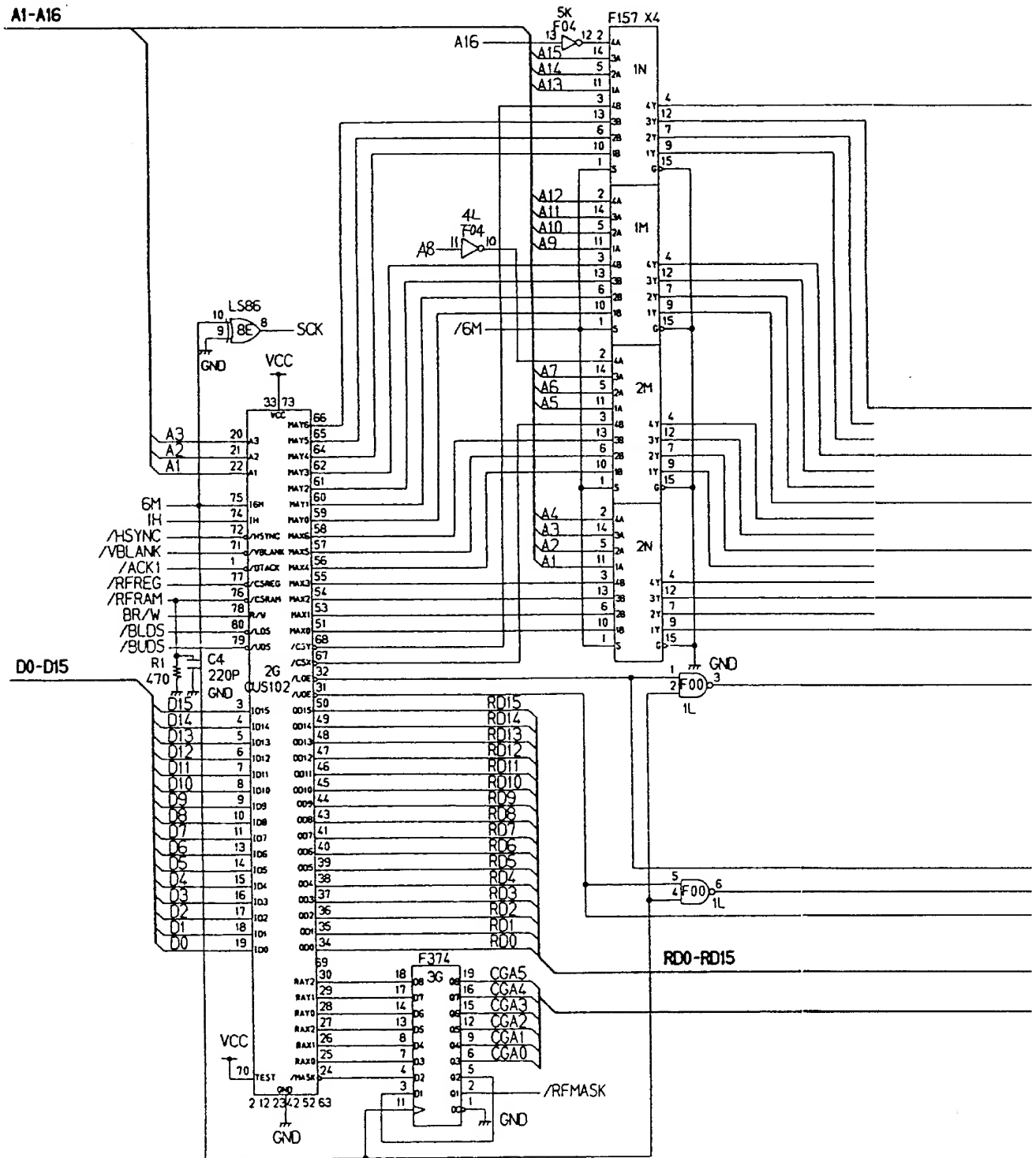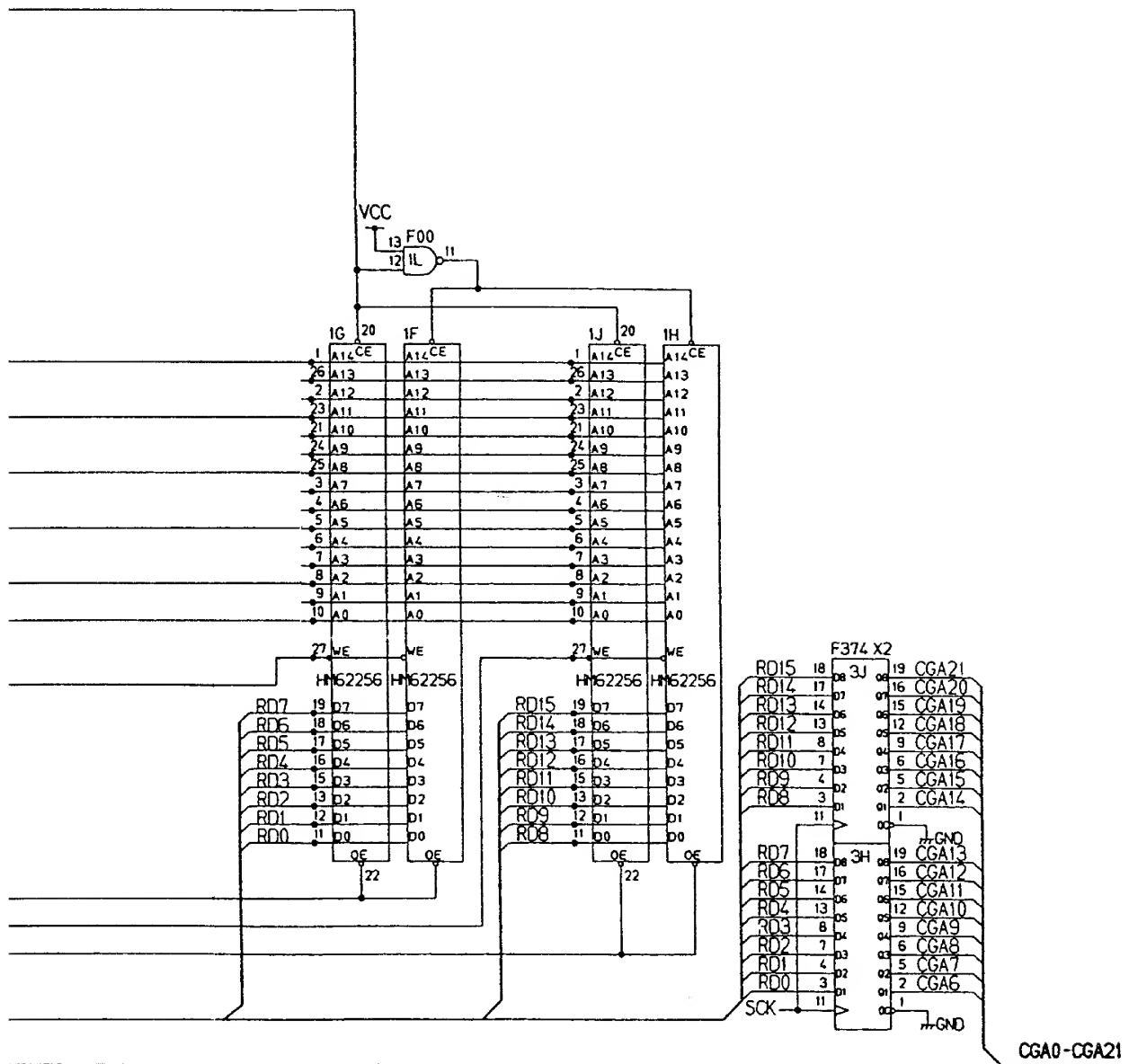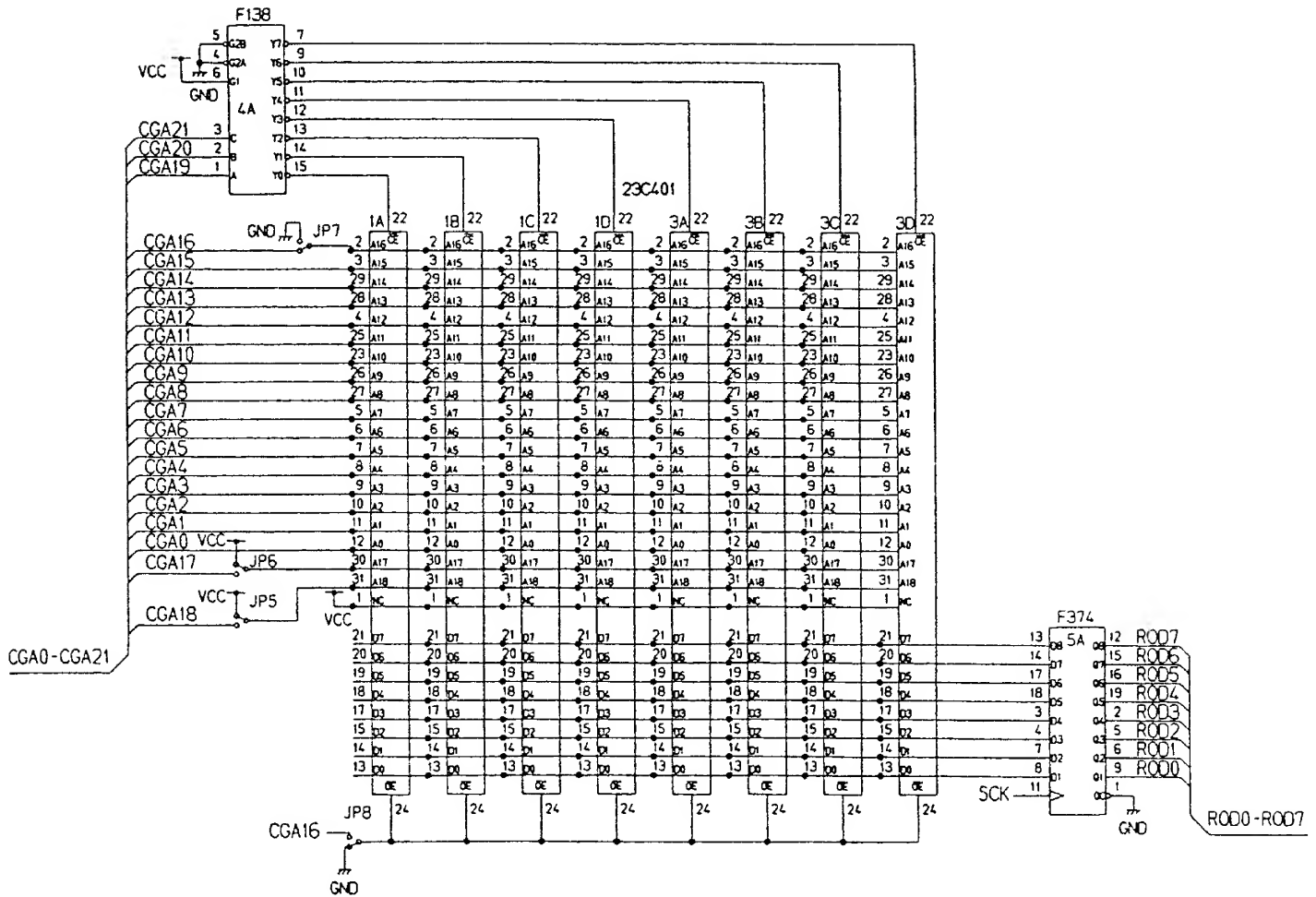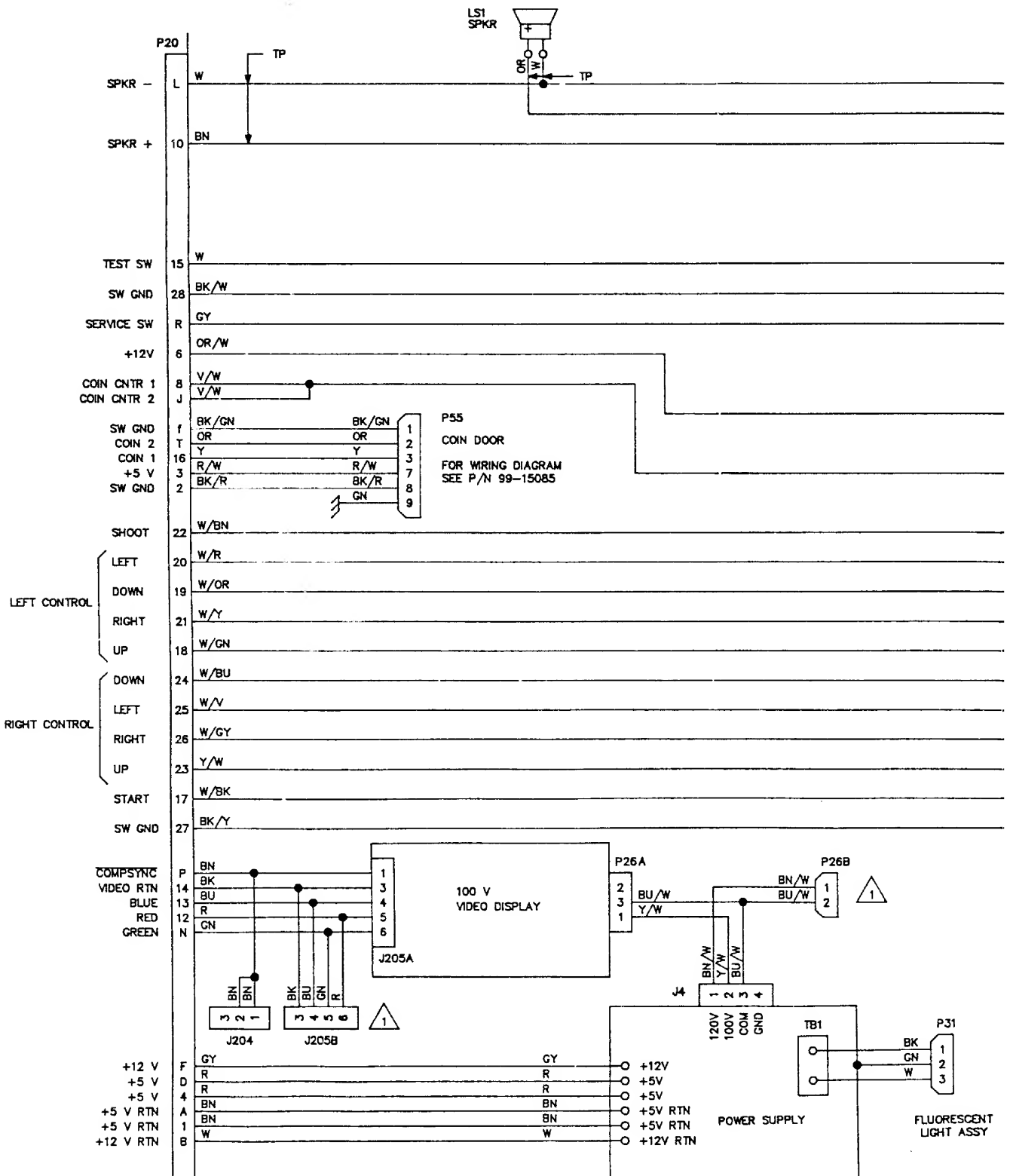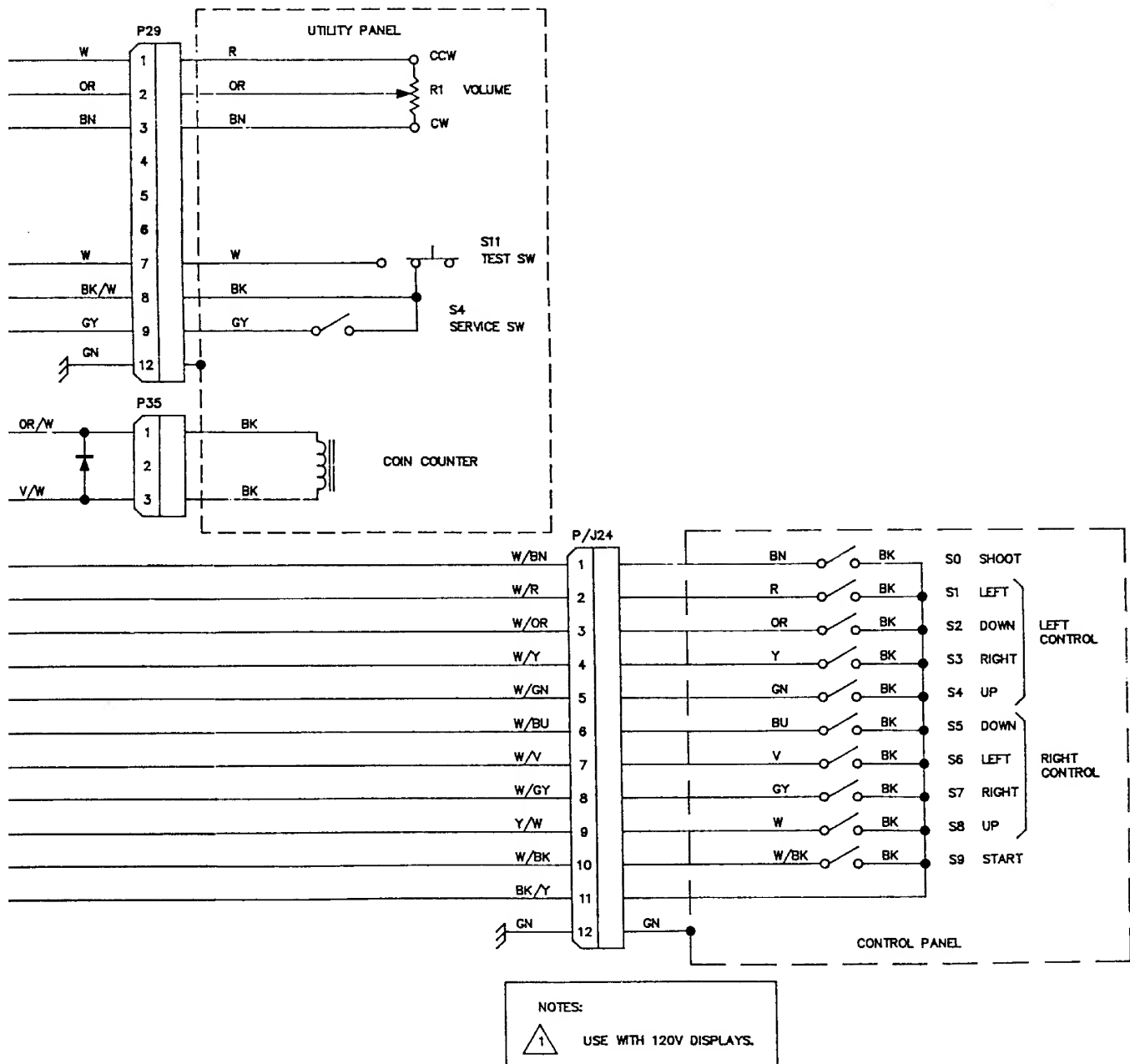Assault™ Video PCB Assembly
Schematic Diagram
(Sheet 8)**

P20

LS1
SPKR

SPKR −   L   W   TP
                                          OR W   TP

SPKR +   10   BN

TEST SW   15   W
SW GND   28   BK/W
SERVICE SW R   GY
+12V   6   OR/W
COIN CNTR 1 8 V/W
COIN CNTR 2 J V/W

SW GND   f   BK/GN   BK/GN   1   P55
COIN 2   T   OR   OR   2   COIN DOOR
COIN 1   16   Y   Y   3
+5 V   3   R/W   R/W   7   FOR WIRING DIAGRAM
SW GND   2   BK/R   BK/R   8   SEE P/N 99-15085
                           GN   9

SHOOT   22   W/BN

LEFT CONTROL
  LEFT   20   W/R
  DOWN   19   W/OR
  RIGHT   21   W/Y
  UP   18   W/GN

RIGHT CONTROL
  DOWN   24   W/BU
  LEFT   25   W/V
  RIGHT   26   W/GY
  UP   23   Y/W
START   17   W/BK
SW GND   27   BK/Y

COMPSYNC   P   BN   P26A   P26B
VIDEO RTN 14   BK   2   BU/W   BN/W   1
BLUE   13   BU   100 V   3   BU/W   2   1
RED   12   R   VIDEO DISPLAY   1   Y/W
GREEN   N   GN

                           J205A

                              J204   J205B   1   J4

                                                        120V
                                                        100V
                                                        COM
                                                        GND

+12 V   F   GY   GY   +12V   TB1   P31
+5 V   D   R   R   +5V   BK   1
+5 V   4   R   R   +5V   GN   2
+5 V RTN A   BN   BN   +5V RTN   W   3
+5 V RTN 1   BN   BN   +5V RTN   POWER SUPPLY
+12 V RTN B   W   W   +12V RTN   FLUORESCENT
                                                                          LIGHT ASSY

UTILITY PANEL

P29

W	1	R — CCW
OR	2	OR — R1 VOLUME
BN	3	BN — CW
	4	
	5	
	6	
W	7	W
BK/W	8	BK
GY	9	GY
GN	12	

S11 TEST SW

S4 SERVICE SW

P35

OR/W	1	BK
	2	
V/W	3	BK

COIN COUNTER

P/J24

W/BN	1	BN — BK — S0 SHOOT
W/R	2	R — BK — S1 LEFT
W/OR	3	OR — BK — S2 DOWN
W/Y	4	Y — BK — S3 RIGHT
W/GN	5	GN — BK — S4 UP
W/BU	6	BU — BK — S5 DOWN
W/V	7	V — BK — S6 LEFT
W/GY	8	GY — BK — S7 RIGHT
Y/W	9	W — BK — S8 UP
W/BK	10	W/BK — BK — S9 START
BK/Y	11	
GN	12	GN

LEFT CONTROL

RIGHT CONTROL

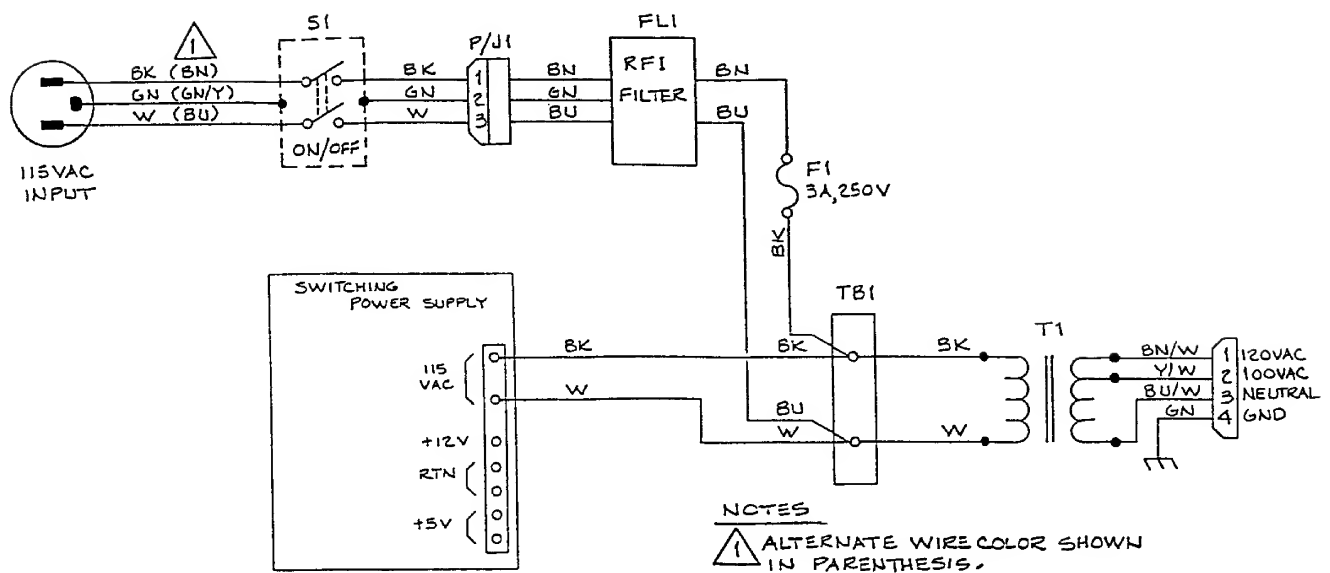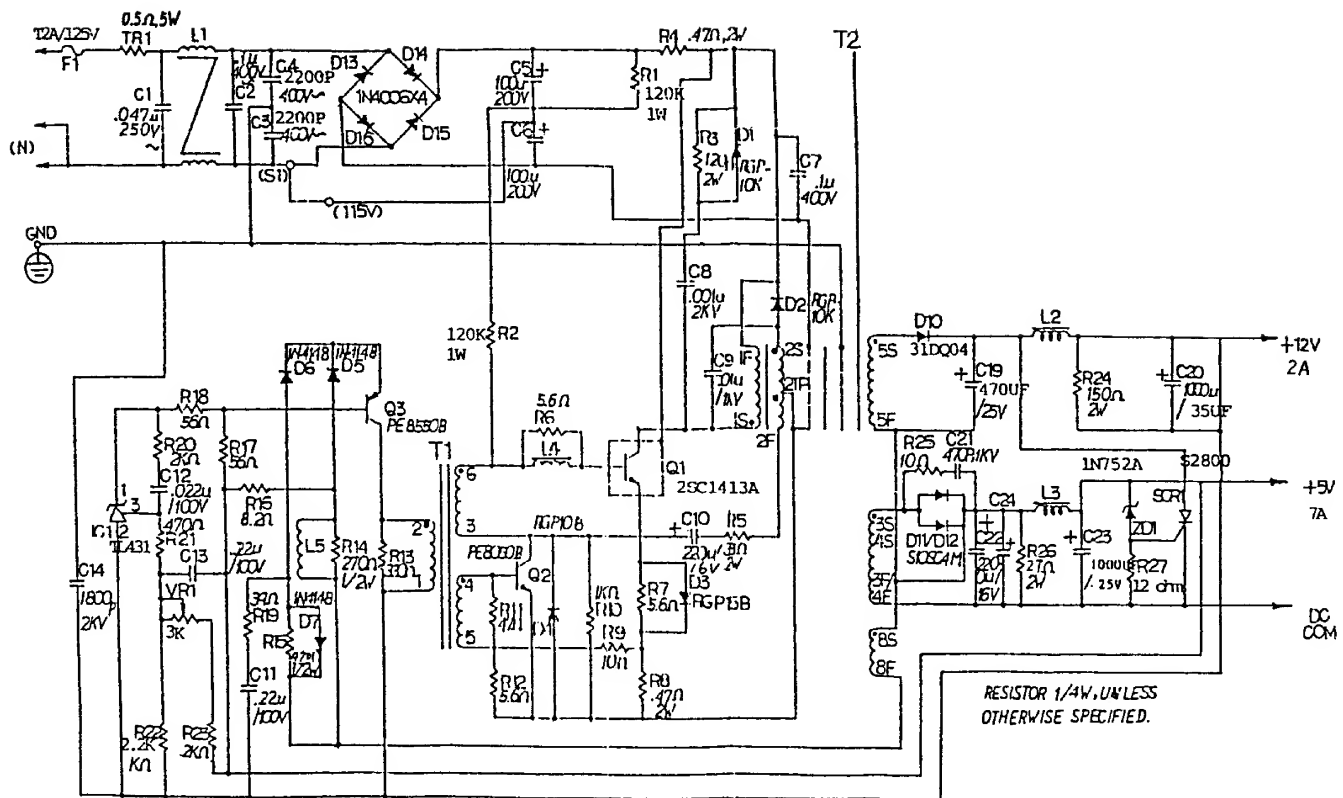CONTROL PANEL

NOTES:

⚠ 1 USE WITH 120V DISPLAYS.

Figure 5-3
Assault™ Main Wiring Diagram

046125-01 A
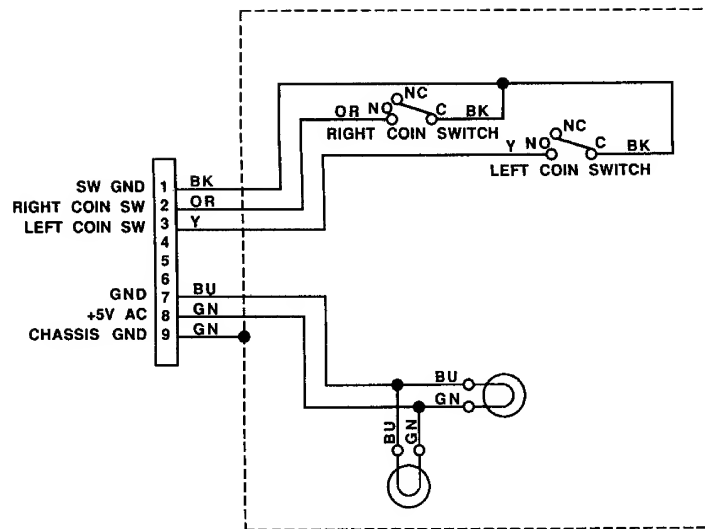
Coin Door Wiring Diagram

SL Power Supply Wiring Diagram

**Hitron 5V/12V Switching Power Supply
Wiring Diagram**

**Figure 5-4
Wiring Diagrams for SL Power
Supply, Hitron 5V/12V Switching
Power Supply, and Coin Door**

046139-01 A   149008-001   171027-001